ECOSYSTEM-BASED FISHERIES MANAGEMENT: PERSPECTIVES OF FISHERY MANAGEMENT COUNCILS AND STAKEHOLDERS IN THE NEW ENGLAND AND MID-ATLANTIC REGIONS

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ECOSYSTEM-BASED FISHERIES MANAGEMENT: PERSPECTIVES OF FISHERY MANAGEMENT COUNCILS AND STAKEHOLDERS IN THE NEW ENGLAND AND MID-ATLANTIC REGIONS

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ABSTRACT

The purpose of the dissertation research was to improve understanding of factors contributing to or preventing progress on ecosystem-based fisheries management (EBFM) implementation for the Mid-Atlantic Fishery Management Council (MAFMC) and the New England Fishery Management Council (NEFMC), focusing on Council member and stakeholder beliefs, attitudes, and understanding. The *Coorientation Model* and the *Planning Table* were used to guide inquiry into the research objectives. The *Coorientation Model* was used to measure the degree of understanding between Council members and stakeholders. The concept of the *Planning Table* addressed whose interests were voiced, acknowledged, and incorporated into planning decisions. Council meetings were observed and 66 individuals were interviewed, including Council members, Council staff members, and Scientific and Statistical Committee (SSC) members in the New England (NE) and Mid-Atlantic (MA) regions, about EBFM. Additionally, more than 5,600 surveys were sent to commercial fishermen, recreational anglers, non-governmental organization leaders, SSC members and MAFMC and NEFMC members in the NE and MA regions about EBFM and over 1,000 responses were received. Neither low

agreement nor low understanding between Council members and stakeholders appeared to be a barrier to NEFMC or MAFMC transition to EBFM. Council members and stakeholders responded that there are needs for social science information for EBFM and that although Council members and stakeholders perceive major barriers to EBFM, Council members and stakeholders do not perceive that these challenges are insurmountable. The study highlights specific barriers, social science needs, time lines and recommendations that MAFMC and NEFMC decision makers could focus on to facilitate the transition from single species fisheries management to EBFM. Specifically, decision makers and stakeholders recommend the development of a pilot plan for EBFM. Overall, managers and stakeholders in both the NE and MA regions generally agreed that EBFM is a holistic approach to fisheries management which includes biological, environmental, and human factors, and that the Councils should gradually transition to a management plan that reflects EBFM.

BIOGRAPHICAL SKETCH

Ingrid Biedron is from Chelsea, Michigan. She graduated from Chelsea High School in 1999. Ingrid completed her B.A. at Dartmouth College in 2003, graduating with a double major in Environmental and Evolutionary Biology and Environmental Studies with Honors. In 2009, she received a M.S. from Cornell University in Behavioral Biology. In August 2014, Ingrid will receive her Ph.D. in Natural Resources from Cornell University.

Dedicated to Dad, Mom, Caitlin, Griffin, and Grandma

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LIST OF ABBREVIATIONS

EBM ecosystem-based management

EBFM ecosystem-based fisheries management

NE New England

NEFMC New England Fishery Management Council

MA Mid-Atlantic

MAFMC Mid-Atlantic Fishery Management Council

SSC Scientific and Statistical Committee

PREFACE

It is the researcher's hope that the findings resulting from this dissertation research can be usefully applied to present and future work in fisheries management and marine conservation.

CHAPTER 1

ECOSYSTEM-BASED FISHERIES MANAGEMENT: PERSPECTIVES OF FISHERY MANAGEMENT COUNCILS AND STAKEHOLDERS IN THE NEW ENGLAND AND MID-ATLANTIC REGIONS

1. Introduction

Ecosystem-based management (EBM), a holistic approach to wildlife and fisheries management (K. L. McLeod & H. M. Leslie, 2009), has increasingly been recommended as a priority in ocean conservation and management as an alternative to conservation strategies focused on single species (Botsford, Castilla, & Peterson, 1997; Field & Francis, 2006). Several highly anticipated ocean science and policy reports have concluded that marine and coastal ecosystems are deteriorating and have recommended progressing from coastal and marine species-based management to EBM. In July 2010, President Obama signed an Executive Order to create a National Ocean Policy called "Stewardship of the Ocean, Our Coasts, and the Great Lakes" (CEQ, 2010). This order directed government agencies and affiliated entities, including the regional fishery management councils (Councils), to prioritize EBM in ocean and coastal management initiatives (SSC, 2010). The purpose of this study was to characterize factors affecting Council adoption of EBM principles, especially the fisheries-specific version of EBM, ecosystem-based fisheries management (EBFM).

To address my research objectives, I used theoretical concepts related to issues of interests, representation, and understanding between Council members and relevant stakeholder groups. Concentrating on two Councils, the Mid-Atlantic Fishery

Management Council (MAFMC) and the New England Fishery Management Council (NEFMC), the focus of my research was to characterize attitudes, beliefs, and mutual understanding between Council members and stakeholders related to EBFM.

2. Background

2.1. Regulatory basis for fishery management councils

In 1976, Congress enacted the Fishery Conservation and Management Act. This act was amended in 1996 and given its current name, the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (NMFS, 2011a). The MSFCMA outlined a two-level management scheme which included eight regional fishery management councils (Leslie & McLeod, 2007). The MSFCMA charged the Councils and the National Marine Fisheries Service (NMFS) with the shared responsibility for developing and implementing fisheries management plans (FMPs) for individual fish stocks within the (U.S.) exclusive economic zone (EEZ), the offshore area of federally-regulated waters 3-200 miles from the U.S. coast (NEFMC, 2014). Within their respective regions, the MSFCMA grants councils the authority to select which fisheries need management and to develop FMPs, amendments, and suggested regulations to manage the selected fisheries (K. L. McLeod & H. M. Leslie, 2009). In the 1996 iteration of the MSFCMA, Congress added language to increase conservation standards and strengthen the MSFCMA's mandate to decrease overfishing and bycatch mortality (K. L. McLeod & H. M. Leslie, 2009). One component of the MSFCMA, the essential fish habitat provision, explicitly mentions EBM and is a reminder that some statutory and regulatory mechanisms already exist that support EBM (K. L. McLeod & H. M. Leslie, 2009). In 2007, the President signed the Magnuson-Stevens Fishery Conservation and Management Reauthorization

Act of 2006 (NMFS, 2011a), which provides the MSFCMA with mandates to reduce overfishing by requiring stricter annual catch limits and accountability measures, suggests market-based fishery management, and encourages international collaboration. Additionally, the "Other Provisions" section of the reauthorized MSFCMA provides authorization for council technical and grant support for development of regional pilot programs to implement EBM and research (NMFS, 2011b). The MSFCMA was scheduled to expire at the end of September 2013. Decisions about MSFCMA reauthorization are expected in the near future (NOAA, 2014).

Councils submit their FMP recommendations to NMFS, and NMFS decides if the recommendations fulfill Congressional mandates. Technically, the Councils are advisory bodies and NMFS is the final decision-making body. However, NMFS is limited in its power to determine FMPs because it can only "approve, disapprove, or partially approve" the Council's recommendations (K. L. McLeod & H. M. Leslie, 2009). Some have accused the Council system of demonstrating "conflicts of interest, lack of accountability, and management failures" (POC, 2003; USCOP, 2004). In recent years, some scientists, managers, and policy-makers have criticized single species fisheries management (SSFM) for not incorporating habitat, economic, and social considerations. As a result, EBFM has been increasingly included in management recommendations by scientists, advocacy groups, and government-related agencies responsible for developing fisheries policy.

Each region's fishery management council has a Scientific and Statistical Committee (SSC, 2010). Approximately twenty SSC members are appointed by each council and serve 3-year renewable terms. The responsibilities of the SSC include

making recommendations, which are based on scientific research and analysis, to the Councils about management decisions. The types of advice could include "recommendations for acceptable biological catch, preventing overfishing, maximum sustainable yield, achieving rebuilding targets, and reports on stock status and health, bycatch, habitat status, social and economic impacts of management measures, and sustainability of fishing practices" (NEFMC, 2012).

The NEFMC and MAFMC each have approximately 10-20 staff members. Responsibilities of the staff include providing information and creating fishery management documents for management decisions, communicating with the public about Council events, facilitating public participation, organizing meetings, and helping advisory groups which provide input regarding the fishery management plans for each stock the councils are responsible for (Table 1) (MAFMC, 2014a; NEFMC, 2014).

Table 1. Stocks which are under management by either the MAFMC or NEFMC.

MAFMC	NEFMC
Summer Flounder, Scup, Black Sea Bass	Northeast Multispecies (Groundfish)
Mackerel, Squid, Butterfish	Scallops
Surfclams and Ocean Quahogs	Monkfish
Bluefish	Herring
Tilefish	Small Mesh Multispecies (Silver Hake/Whiting, Red Hake, and Offshore Hake)
Spiny Dogfish	Dogfish
Monkfish	Red Crab
	Skates
	Atlantic Salmon

2.2. Current NEFMC and MAFMC management plans

To provide context for the current fisheries management conducted by the MAFMC and NEFMC, I present an overview of the FMPs for the three stocks identified as "most important," in an economic and cultural sense for each region, according to selected Council staff members. For the MA region, summer flounder, bluefish, and black sea bass were ranked as the top three most important stocks. If economics are used as the main criteria for judging importance, surfclams and quahogs are at the top of the list (M. S. Member, 2013). The MAFMC FMP for summer flounder also accounts for black sea bass (ranked #3 in importance) and scup (ranked #4 in importance), which makes this FMP a multi-species FMP. Compared to the traditional SSFM approach, this multi-species approach reflects some elements of EBFM. The FMP for bluefish is a SSFM plan, unlike the FMP that combines management of summer flounder, black sea bass, and scup (MAFMC, 2014b). The MAFMC's most tangible step towards EBFM is its development of an Ecosystem Approach to Fisheries Management Guidance Document, which is a non-regulatory document to inform management decisions as the Council progresses from SSFM to an ecosystem-based approach (MAFMC, 2014b). For the NEFMC region, Groundfish, Scallops, and Herring were ranked as the top three most important stocks (N. S. Member, 2013). FMP for Groundfish is based on a Multi-species management unit, Finfish, which includes Cod, Pollock, Yellowtail Flounder, Redfish, Haddock, Witch Flounder, Winter Flounder, White Hake, American Plaice, and Windowpan Flounder. The scallop FMP is based on a SSFM approach. The Herring FMP includes some ecosystem components that acknowledge the migratory nature of

Herring, including objectives to: prevent overfishing of spawning Herring; prevent damage to Herring egg beds; avoid patterns of fishing mortality by age which negatively affect the age structure of the stock; promote U.S. and Canadian cooperation; implement management in cooperation with other Federal and State FMP's; and minimize discards (NEFMC, 2014).

2.3. Progress toward EBFM

The South Atlantic, Gulf of Mexico, Mid-Atlantic, New England, Western Pacific, North Pacific, and Pacific regional fishery management councils are currently carrying out some level of EBFM planning or implementation (Dereynier, 2012). The Caribbean Fishery Management Council is presently working to transition from SSFM to island-based fishery management plans (CFMC; Member, 2014). Over the last several years, both the NEFMC and the MAFMC, though at different stages, have moved toward creating a plan to implement EBFM. The MAFMC, in response to the overwhelming feedback it received during its *Visioning Project* (MAFMC, 2012b) with stakeholders, is moving forward to develop a plan to implement an Ecosystem Approach to Fisheries Management (EAFM) Guidance Document (MAFMC, 2014b). During 2013, the NEFMC suspended progress toward its 2008 decision to develop a plan for and to implement EBFM. In 2014, the NEFMC voted to include EBFM on its 2014 priority list as a multi-year task, and the Council has held two Ecosystem-Based Management Committee meetings to date in 2014.

3. Ecosystem-based management

3.1. Definitions

EBM is defined as "recognizing and addressing interactions among different spatial and temporal scales, within and among ecological and social systems, and

among stakeholder groups and communities interested in the health and stewardship of coastal and marine areas" (Leslie & McLeod, 2007). Increasing numbers of policymakers, scientists, advisors, and managers are acknowledging that the SSFM approach practiced under the MSFCMA (Commerce, 2007) is not sufficient to meet fisheries management objectives. As a result, managers are increasingly considering EBM. In 2005, more than 200 academic scientists and policy experts from institutions in the United States signed a national consensus statement agreeing to a definition of EBM:

"Ecosystem-based management is an integrated approach to management that considers the entire ecosystem, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need. Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it considers the cumulative impacts of different sectors" (Rosenberg & McLeod, 2005).

3.2. Barriers to EBM

Constraints to EBM include lack of institutional support for EBM, politics, geographical uncertainty, and lack of scientific research (K. L. McLeod & H. M. Leslie, 2009). The amended MSFCMA (Commerce, 2007) mandated that the Councils and NMFS account for effects of fishing on marine ecosystems by taking steps to reduce bycatch; replenish depleted stocks; and preserve habitat. However, overfishing has nevertheless occurred and many stocks continue to be depleted. Because overfishing is largely influenced by politics (Rosenberg, 2003), focused interest groups, which in this study include the fishing industry, often have more

power, resources, and motivation than less-focused stakeholder groups (e.g. the public) (Olson, 1971). Consequently, elected officials may respond more often to stakeholders related to the fishing industry than to environmental groups or other groups not related to the fishing industry because the regulated community has a more organized and better funded lobby (Leslie, Rosenberg, & Eagle, 2008).

3.3. Benefits of EBM

The scientific and management realms are consistently recommending the prioritization of EBM in ocean policy (K. McLeod & H. Leslie, 2009; POC, 2003; USCOP, 2004). Due to the declining state of many of the world's fisheries, Link suggested that fisheries management transition to approaches prioritizing EBM (Link, 2010; SSC, 2010). There are some examples of precedent for EBM in terrestrial systems. Terrestrial attempts to practice sustainable development led fisheries managers and scientists to explore EBM and ultimately EBFM (Link, 2010). However, in the U.S., few examples exist in which EBM is implemented in marine environments at a regional scale (Leslie & McLeod, 2007), which is the level of FMC responsibility. Therefore, this study provides an analysis of the practice of EBM at a scale that has been rarely studied.

McLeod and Leslie (2009) provide a set of key principles to guide managers to successful practice of EBM: *1. Apply EBM at several spatial and temporal scales and include both social and biogeophysical factors in these considerations; 2. Acknowledge the connection between ocean ecosystems and humans; 3. Address the management approach that accepts that ocean management includes air and land management initiatives;* and *4. Encourage stakeholder engagement because it is necessary to create practical management strategies that can be enforced"* (K. L.

McLeod & H. M. Leslie, 2009). Although some components of my work are related to *principle #1* and *principle #2*, my research addressed *principle #4* most thoroughly, as my studies focused on *principle #4*, how social factors affect the decision-making process.

4. Ecosystem-based fisheries management

4.1. Definitions

EBFM refers to the process of "managing fisheries to coordinate, account for, and include all factors in a holistic, synthetic, integrated fashion" (Link, 2010). For the purposes of this definition, "fisheries" is an inclusive term that includes protected species, non-target species, and marine mammals. EBFM is an adaptive process that can be modified depending on its context, availability of information, and management needs. It is also place-based, and therefore dependent on the geographic position where it is implemented, with goals and the details of its implementation determined by the biological environment (Link, 2010). The most definitive element of EBFM, compared to current fisheries management strategies by the Councils, is that EBFM is based on a multi-species approach, which is a significant change from the SSFM approach currently practiced under the MSFCMA. The change to a multi-species management approach will have significant implications for fisheries management in the U.S. Overall, some believe an EBFM approach to fisheries management will be a more effective andefficient strategy to manage fisheries than SSFM (Link, 2010).

4.2. Barriers to EBFM

4.2. a. Overview

The interdisciplinary nature of EBFM results in some obstacles to its

implementation. Based on my observations of the Councils (Biedron, 2014) social, cultural, political, and institutional factors may be major barriers to EBFM implementation, including lack of government, legislative, budgetary, and scientific leadership. Economic realities, political appointments, funding cycles, institutional capacity, and user group compliance could also affect the capability of Councils to practice EBFM. Absence of legislation, specific government-related direction, and scientific guidance may be major impediments to Councils interested in initiating implementation of EBFM.

4.2.b. Social/Cultural

Currently, Councils are responsible for evaluating the population status of and developing a FMP for one fish species at a time. Additionally, many fishermen fish exclusively for one or several species of fish for their livelihood. A change to EBFM from SSFM would require a change in mindset about fishing practices and how they are regulated. Fishermen who have a cultural tradition of participating in only one or a few fisheries, and who have the skills, experience, and equipment for only those fisheries, may find it difficult or impossible to transition to EBFM.

Additionally, successful communication between Council members, who are voting on the Councils' actions regarding EBFM, fishery stakeholders whose interests should be reflected in Council decisions, lawmakers, scientific advisors, and governmental oversight agencies, is necessary for Council members to make the most informed and representative decisions possible. The effectiveness of these communication channels is essential to the successful practice of EBFM. My study focused on one element of the communication process among stakeholders, the extent to which Coorientation (accuracy, agreement, and congruency) occurs between

Council members and other stakeholders (described in greater detail in Section *6.3* below). Both the content of the information communicated (legislative mandates; science on which to base management policies; stakeholder wants and needs; agency support) and the effectiveness of communication between Council members and stakeholders will affect the success of the Councils' plans to implement EBFM.

The transition from SSFM to EBFM will be challenging to existing paradigms of fishery management councils, goal-setting processes and targets, and management approaches (Wallace, Cornter, Moote, & Burke, 1996). SSFM has contributed to the development of constituent groups based upon certain fisheries (SSC, 2010); shifting to an EBFM approach will require those separate groups to work together in different ways and to develop novel approaches toward consensus on management decisions. This change could be complicated by differing historical and cultural traditions and beliefs about other groups. The increased need for participation and communication within and between Councils and their stakeholder communities will require that new roles, processes, and perspectives are adopted (SSC, 2010). The transition to EBFM from SSFM will require greater cooperation, and understanding of how perceptions differ between stakeholders will be increasingly important to maximize collaboration and minimize conflicts (K. L. McLeod & H. M. Leslie, 2009).

4.2.c. Political

The structure of regional fishery management councils is political in nature. Specifically, the voting contingent of the Councils comprises the Regional Administrator of NMFS, the designees of the principal state officials with marine fishery management responsibility for states within the region, and members nominated by governors of member states and appointed by the Secretary of

Commerce. Non-voting members are representatives for the U.S. Coast Guard, U.S. Fish and Wildlife Service, U.S. Department of State, and the Atlantic States Marine Fisheries Commission (ASMFC) (NEFMC, 2012). The structure of the Councils means that Council membership is strongly influenced by the political party in power. However, members do have some ability to act with independence from those who appointed them. Members are elected for 3-year terms, and therefore, have a relatively long time to participate as members of the Council. Also, members often serve multiple terms, even if political parties change, because individual experience is often highly valued in the appointees. Member support or lack of support for the Councils' decisions about fishery management decisions could be influenced by personal interests of the members, appointing-body pressures, and/or constituent interests. Consequently, who is at the table, what interests they represent, and how much power (economic and political) they have to influence decisions may play a large part in fishery management decisions and may play a role in how Councils address EBFM.

4.2. d. Institutional

Institutional structure and organization may act as important influences on Council decisions. Lack of governmental leadership, lack of scientific data, and lack of formalized scientific and institutional recommendations for transitioning from the current SSFM system to EBFM are all potential barriers to Council implementation of EBFM. The MSFCMA (Commerce, 2007) is the guiding piece of legislation regarding the federal U.S. EEZ. Historically, there has been an institutional precedent to practice SSFM under the MSFCMA (Commerce, 2007), which includes language referring to the importance of supporting an ecosystem-based approach and including

social factors in the Council decision-making process. Lack of legal mandates, specific government-related direction, and scientific guidance may be major impediments to Councils. Arguably, in order for the procedural changes to be made on a level that would result in Council transition from SSFM to EBFM, institutional guidance, redirection, or reorganization may be required. Many stakeholders believe (Biedron, 2014) that in order to transition from SSFM to EBFM, legislative changes within the MSFCMA need to be made. The MSFCMA is currently undergoing reauthorization, which may result in changes that would more explicitly mandate the use of EBFM.

The primary premise of the MSFCMA inherently outlines a legislative basis for SSFM. Specifically, the MSFCMA designates the eight regional fishery management councils, within the portion of federal EEZ adjacent to the states represented in each council (NEFMC, 2014) to:

(1) for each fishery under its authority that requires conservation and management, prepare and submit to the Secretary (A) a fishery management plan, and (B) amendments to each such plan that are necessary from time to time (and promptly whenever changes in conservation and management measures in another fishery substantially affect the fishery for which such plan was developed) (Commerce, 2007).

Additionally, any fishery management plan implemented by the councils must meet the *National Standards*, (Commerce, 2007), which are listed below:

1. *Prevent overfishing while achieving optimum yield.*
2. *Be based upon the best scientific information available.*

3. *Manage individual stocks as a unit throughout their range, to the extent practicable; interrelated stocks shall be managed as a unit or in close coordination.*
4. *Not discriminate between residents of different states; any allocation of privileges must be fair and equitable.*
5. *Where practicable, promote efficiency, except that no such measure shall have economic allocation as its sole purpose.*
6. *Take into account and allow for variations among and contingencies in fisheries, fishery resources, and catches.*
7. *Minimize costs and avoid duplications, where practicable.*
8. *Take into account the importance of fishery resources to fishing communities to provide for the sustained participation of, and minimize adverse impacts to, such communities (consistent with conservation requirements).*
9. *Minimize bycatch or mortality from bycatch.*
10. *Promote safety of human life at sea.*

(Commerce, 2007; MAFMC, 2014a)

The clause MSFCMA *104-297* (Commerce, 2007) says that the councils must create a fishery management plan for each fishery under its authority. Therefore, the basis of the MSFCMA is to create a plan for each stock, which supports SSFM. Specifically, *National Standard #1*, requiring optimum yield from each fishery, supports SSFM. The MSFCMA does not exclude the possibility of EBFM, but in its most direct interpretation, it suggests the development of FMPs for each stock, and SSFM, which is the approach the NEFMC and MAFMC historically have largely taken in their management.

However, the MSFCMA does provide some legislative teeth for EBFM. Several of its *National Standards* support management that includes some ecosystem characteristics including: *National Standard #3*, about interrelated stocks being managed as a unit or in coordination; *National Standard #6*, referring to allowing for variations among, and contingencies in, fisheries, fishery resources, and catches; *National Standard #8*, addressing the social and economic impact to communities; and *National Standard #9*, which suggests minimizing bycatch and mortality of bycatch to the extent practicable (Commerce, 2007).

The MSFCMA's largest constraint to EBFM is that it includes language that specifically directs the creation of SSFM plans, but does not explicitly require EBFM, although it includes clauses that support an ecosystem approach. The MSFCMA does not include language that prevents EBFM. A reauthorized MSFCMA that does include explicit language requiring EBFM would remove a major constraint, in the opinion of many stakeholders (Biedron, 2014), to the NEFMC and MAFMC's adoption of EBFM.

EBFM creates new data needs for information regarding ecosystem-level management decisions and other regional fishery management councils and prioritizes public participation. Therefore, this approach may strain agencies that already lack resources, including funding, time, and staff, and cause additional burdens on management agencies that are struggling to meet current organizational demands. Additionally, some stakeholders worry that EBFM is a complex process that could introduce uncertainty into the decision-making process, that ecosystem-level mandates will undermine useful and effective SSFM requirements, and that traditional, historical SSFM stakeholder groups and processes may be disrupted (Link, 2010; SSC, 2010).

4.3. Benefits of EBFM

4.3.a. Overview

Despite the many potential barriers to incorporating EBFM into the Council management process, there are motivating factors as well. The intended benefits of practicing EBFM include: "delivering a quality product, diverse fishing opportunities, effective governance, a healthy ecosystem, healthy fish stocks, healthy fishing communities, and sound science" (Link, 2010; SSC, 2010). EBFM is recommended as a management approach for its many benefits.

EBFM strives to address multiple levels of the environment including fisheries stocks, non-target species, protected species, biodiversity, habitat, ecological interactions, climate change, and system-wide processes (Link, 2010; SSC, 2010). Therefore, EBFM provides the Councils with a tool to simultaneously address several responsibilities that they are responsible for under the MSFCMA's mandate to "manage marine living resources" rather than having to piece together SSFM practices to fulfill the mandates. Because EBFM acknowledges the interactions between species, habitats, and humans, predictions of future conditions may reflect more realistic situations than predictions based on data from SSFM (Link, 2010).

EBFM studies humans' use of the oceans, and the vulnerability and resilience of their communities, which are important to determine the present, as well as future, needs of humans (SSC, 2010). EBFM, with its multi-species approach and freedom to decide on tradeoffs, allows more flexibility in working with fishermen to determine management plans (SSC, 2010) and may sometimes streamline the management process. EBFM initiates increased coordination with other government EBM initiatives including state and local agencies and other regional fishery management

councils and prioritizes public participation (Link, 2010; SSC, 2010).

4.3.b. Social/Cultural

Whether or not the Councils determine that they are required by law to practice EBM, and by extension, EBFM, national ocean management in general is moving toward an ecosystem-level management approach (CEQ, 2010). Therefore, if the fishery management councils do not participate in the discussion about a framework to implement EBM, they may risk being excluded from policy discussions, thereby losing an opportunity to voice their interests regarding EBM (SSC, 2010). Joining the conversation about EBM early in the management strategy development process, including trying to gain a seat for the fishery management councils on the Regional Ocean Boards designated by the National Ocean Policy (CEQ, 2010), which the NEFMC and MAFMC have done, could give the Councils a stronger voice to advocate for fishing interests throughout the coastal and marine spatial planning process.

4.3.c. Political

As stated previously, governors and Secretaries of State who appoint Council members may feel pressure from their constituents to support EBFM. Therefore, there may be pressure on appointed Council members to support EBFM. Additionally, the Executive Branch supports management approaches that reflect EBFM in its National Ocean Policy (CEQ, 2010), another incentive for the Council members and the states, organizations, and agencies that they represent to develop management strategies that incorporate EBFM.

4.3.d. Institutional

The Executive Order calling for a National Ocean Policy (CEQ, 2010)

provides a strong Executive Branch mandate for federal agencies to prioritize EBM, and by extension EBFM, in their management activities. Additionally, language in the MSFCMA, the *National Standards* that guide Council actions, and the Pew Oceans Commission and U.S. Commission on Ocean Policy reports (POC, 2003; USCOP, 2004) strongly recommend EBM. Ideally, an EBM approach could streamline the current SSFM approach, reducing bureaucratic costs in resources and time.

Although more data are needed about transitioning to EBFM, there is a foundation of science demonstrating benefits of EBFM and providing enough information about EBFM to begin the process. Although initial Council support for EBFM has evolved slowly, efforts to incorporate ecosystem approaches to fisheries management are not new and will continue to be a priority for Council management. Furthermore, the continued environmental and biological degradation of the oceans, including the depletion of many fisheries stocks (Link, 2010; K. L. McLeod & H. M. Leslie, 2009), has intensified the urgency of moving toward EBFM. Based on the currently available data, many policy makers see EBFM as a potentially powerful approach to ocean management and conservation (K. McLeod & H. Leslie, 2009).

5. Recommendations for future EBM action

Previous examples of EBM demonstrate the characteristics of successful EBM in practice. Two national-level examples include Canada's "Oceans Act" and Australia's "Oceans Policy" (Leslie & McLeod, 2007). International-level examples of successful implementation of EBM include the United Nations Environment Programme (UNEP, 2006), which could be a model for ocean EBM in the U.S. (Leslie & McLeod, 2007). There are many opportunities for scientists to contribute to the field of EBM. These include a consistent need to improve knowledge of ecological

and social characteristics of marine ecosystems and an increase in scientific capacity, synthesis and communication of science to policy makers and stakeholders (Leslie & McLeod, 2007). However, although more research about effectively practicing EBM is needed, globally, there are enough examples of EBM in ocean ecosystems to begin implementing EBM in a fisheries management context (Leslie & McLeod, 2007). Researchers have made some specific recommendations for contributions that natural and social scientists could make to the field of EBM, which address scientific understanding, monitoring, and tool development:

1. Increasing understanding of marine ecosystems through research, including studies on the social and ecosystem factors related to coastal and ocean systems, monitoring those factors, and the creation of techniques to increase knowledge and promote adaptive management (Leslie & McLeod, 2007).
2. Creating a set of ecological, economic, social, and institutional indicators to track ecosystem health and response to management (Leslie & McLeod, 2007). Examples of indicators of social system processes and patterns include the effects of household, community, and institutional structures on individuals and communities in addition to how demographics, technology, and financial patterns affect communities (K. L. McLeod & H. M. Leslie, 2009).
3. Developing tools that increase the knowledge of adaptive management, which researchers recommend, for ocean ecosystems (Arkema, Abramson, & Dewbury, 2006).

Overall in ocean management, there is a need for interdisciplinary capacity and communication and connections between the natural and social sciences (NRC, 2004). Additionally, there is a need for the synthesis of existing research (Guerry, 2005) and

communication of science to practical and applicable contexts (Cash et al., 2003; Lubchenco, 1998). Researchers outline a specific need for progress in implementing EBM at state and regional levels, including an increase in representation of a wider range of interests and values in decisions regarding fisheries management, especially in the context of the regional fisheries management council process (Leslie & McLeod, 2007). A final recommendation from experts in the field of EBM is, "natural and social scientists must better integrate their fields to address the questions that will arise as EBM is implemented, to develop effective partnerships, and to be able to convey the outcomes of such work to policymakers and the public" (K. L. McLeod & H. M. Leslie, 2009).

Although some work has been done on inclusion of social factors in EBFM models (Link, 2010), and some research has been started in assigning values to ecosystem services (MAFMC, 2012a), there has been little work completed to explore the social factors influencing the practice of EBFM. For the Councils, a number of presentations and discussions about transitioning to EBFM have highlighted the need for more research on the feasibility of transitioning from SSFM to EBFM , especially the need for more social science research (SSC, 2010), but they lack a tangible framework of recommendations from the government or scientific sectors (Zeeman, 2011). To help address this lack of social science research, one focus of my study is to explore how issues of access, influence, and communication affect Council decisions about EBFM, and thereby contribute social science information that will help Councils, specifically the MAFMC and the NEFMC, to outline specific recommendations for their transition from SSFM to EBFM.

6. Theoretical Frameworks

6.1. Overview

In this section I explain the two major theoretical concepts I use to frame the study: the *Planning Table* (Cervero & Wilson, 2006) and the *Coorientation Model* (Connelly & Knuth, 2002; Leong, McComas, & Decker, 2008; McLeod & Chaffee, 1973). To evaluate fishery management Council interests, representation, and power, I use the *Planning Table* theory (Cervero & Wilson, 2006). To characterize communication dynamics between the Council and fisheries-related stakeholder groups, I use the *Coorientation Model* (Leong et al., 2008).

6.2. Planning Table

The concept of "working the planning table," addresses whose interests are voiced, acknowledged, and incorporated into planning decisions (Cervero & Wilson, 2006). In the *Planning Table* context, interests are described as "predispositions, embracing goals, values, desires, and other orientations and inclinations that lead a person to act in one direction or another" (Morgan, 1997) and "the motivations and purposes that lead people to act in certain ways when confronted with situations in which they must make a judgment about what to do or say" (Cervero & Wilson, 2006). Although much of the available *Planning Table* discussion is in the context of educational program planning, the theory has parallels to the planning and management issues dealt with by the Councils. Therefore, the conceptual basis of the *Planning Table* approach offers insights that are applicable to my research with Council implementation of EBFM. For example, Raik and Wilson (2005) studied the influence of power and interest on the wildlife management planning process in order to improve understanding of the influence that political interests have on wildlife

management. In both the Raik and Wilson study and my proposed study, interactions between managers and government, resource users, business, and citizens are monitored to better understand the human dimensions factors that affect the wildlife planning process (Raik, 2006).

The *Planning Table* theme addresses the concept of who gets a voice in the decision-making process. For the purposes of this study, this translates to "who is a member of the fishery management council?" or "which non-members have access to and can influence the votes of Council members?" Federally-managed fisheries management decisions under the MSFCMA are largely decided on by Council votes, so the Council members have significant control over the management of fisheries stocks in their region.

The version of the EBFM plan that Councils decide to implement may depend largely on the personal interests of the individuals who make up each Council and the user groups that those individuals represent. Wilson and Cervero's concept of the *Planning Table* describes the perspective that for an individual's or group's interests to be addressed and incorporated into a final management plan, each individual or group must have a seat at the metaphorical or literal *Planning Table* (Cervero & Wilson, 2006). If the Councils are not proportionately representative of regional fisheries stakeholders, then some stakeholder interests do not have a place at the "planning table," and therefore, the Council's decisions regarding EBFM may not represent the interests of all stakeholders in the region. One potential consequence of a lack of stakeholder representation for Council decisions is that stakeholders will not be as supportive of Council decisions, including efforts to implement EBFM, if they believe their input was not considered in the Council's decision.

"Who is at the table?" is one of the theory's main themes, referring to who has the political, financial, informational, historical, and/or cultural means to gain access to the policy discussion, or "a seat at the table" (Cervero & Wilson, 2006). Being at the table is an important factor in having an individual's or group's interests about an issue addressed. Having a seat at the table at least provides the participant with an opportunity to express her/his interests or her/his constituents' interests in an issue, and maximally, allows the participant to gain the greatest advantage for her/his and or her/his group's interests in the organizational decisions made during the conversation, depending on how much power each representative has and whether she/he is willing to apply that power (Wilson, 2014). The *Planning Table* theory can be applied to the study of how social dimensions affect Council decisions about support for EBFM. One way to rephrase the question, "Who is at the table?" is in the context of Council action toward EBFM as "Who are the members of the Council?" and "Which members'/user groups' interests are prioritized by the Council?" Another component of the "Who is at the table?" question is "Who are non-member stakeholders who have access to and can influence the votes of the members who are actually at the table?"

"Who benefits?**"** is another of the theory's main themes, addressing whether the individual or group represented at the table has the power to gain traction and prioritization of her/his interests (Cervero & Wilson, 2006). Factors influencing power-dynamics include money, politics, history, and credibility. Those with the best ability to exert pressure on the others at the table and/or convince others to support their interests will most likely have their interests addressed. The question, "Who benefits?" could be rephrased for the context of Council action toward EBFM as "Which members'/user groups' interests are prioritized by the Council?"

"What for?" is a third tenet of the *Planning Table* theory, seeking explanations for why some interests are acknowledged in final management decisions while others are not pursued by the organization. Factors that may influence what interests are addressed include priorities of the organization, including public versus individual needs, individual preferences and values, funding, and/or management time lines. The "What for?" question creates a big picture perspective to identify how the decisions that organizations make are justified (Cervero & Wilson, 2006). Council members vote on Council actions to fulfill the Council's mandate to manage the region's fisheries, including decisions about EBFM. A variety of factors could influence votes on Council issues, including responsibilities to constituents, pressures from appointing bodies, personal interests, Council precedent, Council seniority, understanding of scientific information, and commercial and recreational fishery economics.

Once the Council members have been selected, metaphorically, once the decision of who has a seat at the table has been made, other relevant questions are: *What user group's interests are the members selected to represent? Whose interests do members advocate for in reality? Do they represent those interests of their supposed stakeholders, those of themselves, or those of another or broader group? Do stakeholders believe that their representatives are promoting their interests?* In order to understand the factors affecting Council support, (or lack of support), for EBFM, it is important to identify whose interests are driving Council decisions. However, even if the Councils had an equitable representation of stakeholders, every need could not be represented by the members on the Council, a reality which most individuals expect. Even if interests are consensual and power equally distributed, interests are often diluted, altered, omitted, or rejected. In order to study the social

dynamics of decision-making by the Councils, it is important to determine which individuals with what amount of power represent which interests (Wilson, 2014). Enforcement and monitoring are components of most natural resource management strategies, but they are dependent on funding and scope and will rarely be more wide-spread than self-monitoring. If all stakeholder perspectives, including those from the commercial and recreational fishing industries, those from non-governmental organization (NGO) leaders, and those of the science community (SSC, 2010), are not all represented by the Council, there needs to be communication between those at the table (on the Council) making decisions and/or voting about management and the people on the ground who will be acting out, implementing, and living with those decisions. To be complete, this communication should include insight from the resource users about barriers to implementing EBFM, incentives that could motivate them to support EBFM, and other factors influencing fishing community practice of EBFM. This study contributes to an improved understanding about perceived barriers to, incentives that could motivate support of, and other factors influencing the implementation of EBFM.

6.3. Coorientation

6.3.a. Communication, Understanding, and Perceptions

Due to the variety of stakeholder groups represented at the *Planning Table* (Cervero & Wilson, 2006), communication between user groups is an important element of decision-making. In the context of the fishery management councils, communication between the Council members, Council staff, scientists, government agency representatives, and stakeholders is necessary for effective management decisions to be made. Ideally, if Council members represent their constituents, they

would understand the views of the stakeholders they represent regarding Council issues. Council members would then vote on Council issues with their constituents' interests informing member votes. In order for Council members to understand their constituents' opinions on issues, there must be effective communication and some degree of mutual understanding between Council members and stakeholders. A lack of communication between Council-related stakeholders could be a barrier to EBFM. The *Coorientation Model* provides a framework to characterize communication and understanding between groups (Leong et al., 2008). The *Coorientation Model* is an approach that can measure the dynamics of the communication exchange and the levels of agreement, congruency, and accuracy in values between Council members and stakeholders. Measuring the degree of understanding between members of the Councils and SSC members and members of fisheries-related stakeholder groups will allow for comparisons of beliefs about EBFM between these groups.

6.3.b. Coorientation Model: comparing Council and stakeholder perspectives of EBFM

The *Coorientation Model* can serve as a tool to characterize the quality, particularly the agreement, accuracy, and congruency of communication between the Council members, SSC members, and stakeholders from the commercial and recreational fishing industries and NGOs. One of the earlier definitions of "Coorientation" is "cognitive transactions between persons" (McLeod & Chaffee, 1973). This definition is based on the assumption that a person has two separate cognitive abilities: understanding what he/she thinks and estimating what another person thinks (about the same subject). These two "thoughts" allow for three variables to be created: agreement, congruency, and accuracy (McLeod & Chaffee,

1973), which can be used to evaluate understanding between two entities. The *Coorientation Model* compares members within a group with "out-group" members, i.e., those from a different group (Connelly & Knuth, 2002). The definitions of agreement, accuracy, and congruency are:

- *Agreement:* "the extent to which the organization and the public hold the same attitudes and beliefs";
- *Accuracy:* "the extent to which the organization's or the public's estimate of the other's attitudes and beliefs is similar to the other's actual attitudes and beliefs";

  and
- *Congruency:* "the extent to which the organization's or the public's estimate of the other's attitudes and beliefs is similar to their own" (Leong et al., 2008).

In the context of this study, the *Coorientation Model* was used to measure the degree of understanding between Council members and stakeholders, including SSC members (Leong et al., 2008). In this study, I used the following definitions of agreement, congruency, and accuracy, in which "the Council" refers to Council members and "stakeholders" refers to SSC members, commercial fishermen, recreational anglers, and NGO leaders:

- *Agreement* is "the extent to which Council members and stakeholders hold the same attitudes and beliefs";
- *Accuracy* is "the extent to which Council members' estimates of the stakeholders' attitudes and beliefs is similar to the stakeholders' actual attitudes and beliefs"; and

- *Congruency* is "the extent to which the Council members' estimates of stakeholders' attitudes and beliefs is similar to the Councils members' own attitudes and beliefs" (Leong et al., 2008).

The *Coorientation Model* has been used in an environmental context in several previous studies (Connelly, Knuth, and Kay, 2002; Leong et al., 2008). These studies in natural resource management have illustrated that managers need to be aware of different stakeholder perspectives in order to acknowledge differences or attempt to modify the perspectives of others (Leong et al., 2008). Council members' perceptions of ecological and social factors influencing the fisheries they manage could be dependent on geographical and financial constraints that could affect stakeholder ability to attend, and therefore stakeholder representation at, Council meetings (Brzezinski, Wilson, & Chen, 2010). I used the *Coorientation Model* to evaluate understanding between a decision-making group, Councils, and fisheries-related stakeholders. This is a similar context to previous work (Leong et al., 2008), except that the Councils are 2-3 times larger than the decision-making groups included in previous studies.

Lack of agreement, accuracy, and congruency between stakeholder perspectives could influence execution of goals (Scarnecchia, 1988). Using the *Coorientation Model* could help fishery management councils determine what barriers stakeholders perceive in the transition from SSFM to EBFM. Coorientation research could measure accuracy of Council members' perceptions of stakeholder groups' understanding of, concerns about, and attitudes toward EBFM. Making the transition from SSFM to EBFM, at least in the initial stages, may require more coordination between Council members and stakeholders than current management requires, and

therefore, understanding between stakeholders will be increasingly important to maximize collaboration and minimize conflicts. Support for the transition from SSFM to EBFM was the measure of interest in this study, and the groups for comparison were the Council members and fishery stakeholder groups (Figure 1).

To address my research objectives, I measured: agreement between the Council and each stakeholder group; the accuracy of the Council's estimates of each of the stakeholder group's perspectives; and the congruency of the Council's estimates of each of the stakeholder group's perspectives. I only measured the accuracy and congruency of the Councils' estimates of each of the stakeholder group's perspectives, and not vice versa, because it is the Council that will be making the policy and scientific decisions about EBFM. To address my research objectives, I was interested in determining how the beliefs and attitudes of Council members about EBFM compared to fisheries-related stakeholders' perspectives of EBFM; if the Council members accurately predicted the perspectives of the stakeholders; and how Council member predictions of stakeholder preferences compared to Council member predictions.

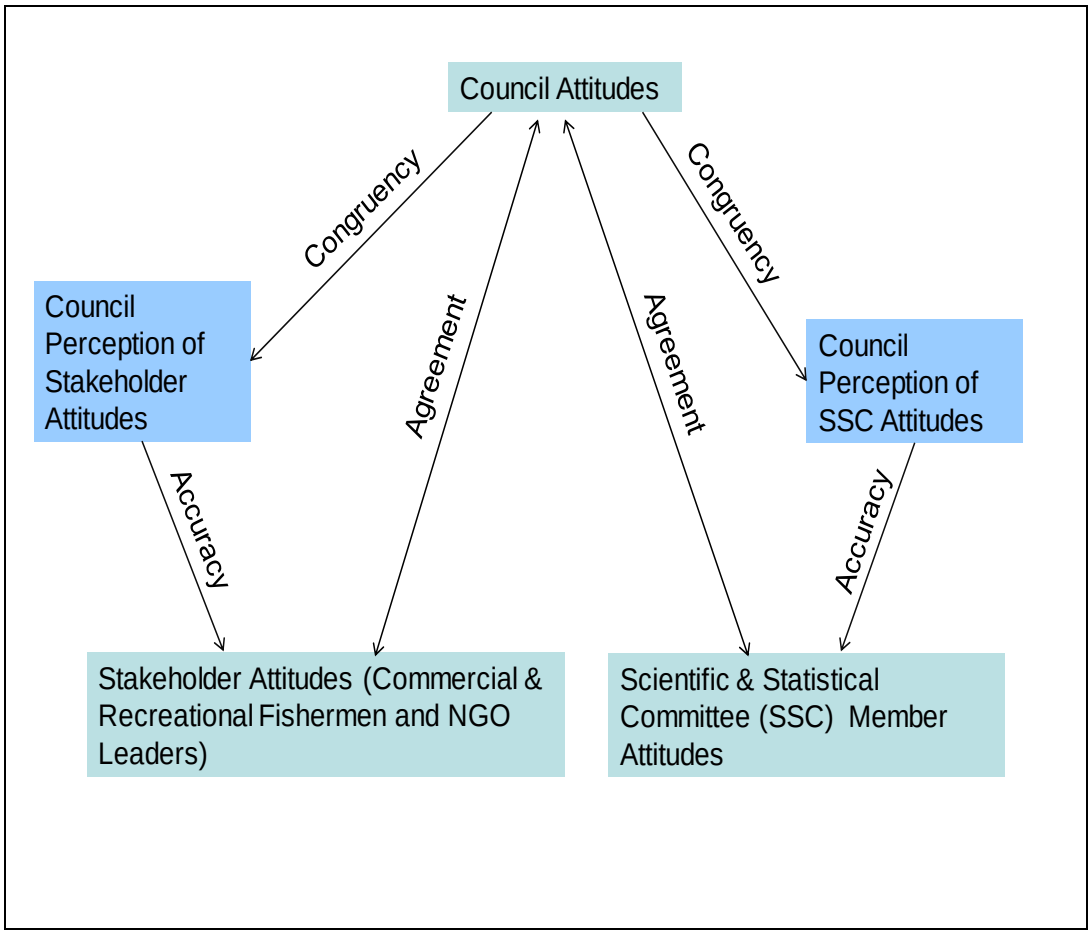

Figure 1. Coorientation model used in the study, adapted from previous work (McLeod and Chaffee, 1973; Connelly and Knuth, 2002). The figure represents how *Agreement*, *Accuracy*, and *Congruency* were measured among Council members and stakeholders for the MA and the NE regions. The term *Council* refers to either NEFMC or MAFMC members.

For the purposes of Figure 1 the term "Attitudes" refers to beliefs about Council member, SSC member, and stakeholder decisions, processes, and actions related to EBFM. In Figure 1, "Council Attitudes," "SSC attitudes," and "Stakeholder Attitudes" refer to the aggregated (mean) measures of the Council member, SSC member, and stakeholder support of EBFM (Connelly & Knuth, 2002; McLeod & Chaffee, 1973). The aggregated means were calculated for the NEFMC and the MAFMC separately. The term "Stakeholder Attitudes" in Figure 1 represents the aggregated (mean) measures of members of each stakeholder group's support of

EBFM. The aggregated means were calculated for stakeholder groups from the regions regulated by the NEFMC and MAFMC separately. The fisheries-related stakeholder groups included in Figure 1 are: commercial fisheries; recreational anglers; and non-governmental organization leaders. Additional details are provided in Chapter 2.

6.4. Theoretical Synthesis

My study provides insights about the extent of understanding between the Council members, SSC members, and stakeholders about the needs, preferences, science, and barriers to be considered when transitioning from SSFM to EBFM. If understanding could be improved, then future management initiatives could include facilitating communication/information exchange. The two theoretical concepts, the *Planning Table* and the *Coorientation Model*, were used in this study to address my overall research objective: to identify factors, especially social factors, influencing the MAFMC and NEFMC's adoption of EBFM. This research included work with the commercial fishing industry, the recreational fishing industry, NGOs, SSC members, and Council members to learn about which social science needs are required for their transition to EBFM. Ultimately, I hope this study increases awareness about the importance and role of mutual understanding in the effectiveness of natural resource management decisions made by a small group of decision-makers that are implemented by a more diverse and sizeable stakeholder population.

7. Research Questions

Some previous efforts to transition from SSFM to EBFM have been slow, bureaucratically laborious, or nonexistent (Francis, Hixon, Clarke, Murawski, & Ralston, 2007). However, in the NE and MA regions where this study took place,

stakeholder attitudes, scientific knowledge, institutional culture, governance, and legislative interpretations appear to support the introduction of EBFM as a viable fisheries management option. Why, then, has a transition to EBFM been so difficult for the NEFMC and the MAFMC? The overall goal of the study was to identify factors influencing the MAFMC and NEFMC's adoption of EBFM.

The study explored if Council members and stakeholders agreed about EBFM topics, how well the Council members predicted stakeholder responses, and how similar Council member predictions for stakeholders were to their own responses. Additionally, the study explored potential opportunities for improvement in understanding between the Councils and stakeholders. To explore the responses of the Council members and fisheries-related stakeholder groups, a survey, using the *Coorientation Model* (Connelly & Knuth, 2002; Leong et al., 2008; McLeod & Chaffee, 1973), was used to calculate agreement, accuracy, and congruency between Council members and stakeholders. Specifically, the study explored NEFMC and MAFMC members' and stakeholders' answers to the following questions, how accurately Council members predict stakeholders' answers to these questions, and how similar Council members' predictions are to their own answers.

The key survey questions addressed in the study were: *What concepts should be included in the definition of EBFM?*; *What practices should be implemented in the NEFMC/MAFMC over the next 10 years?*; *What should be the desired outcomes for fisheries management in the NEFMC/MAFMC over the next 10 years?*; *What are barriers to NEFMC/MAFMC implementation of EBFM?*; and *What type of social science information is needed to support informed decisions for federally-managed fisheries in the New England/Mid-Atlantic region?*

8. Management implications

The application of the *Planning Table* and the *Coorientation Model* theories to EBFM and the MAFMC and NEFMC provided insights into how an improved understanding of the attitudes, beliefs, and communication of Council members, SSC members, and stakeholder groups could potentially help overcome barriers to and facilitate the implementation of EBFM.

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CHAPTER 2

METHODS

1. Overview

I applied a mixed methods approach to my research, including both qualitative and quantitative approaches. In *Phase 1* and *Phase 2*, I used qualitative methods and in *Phase 3* I used quantitative methods. *Phase 1* was an exploratory approach to learn about the New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC) and their respective Scientific and Statistical Committees (SSCs) and included an information and document review, meeting observations, and preliminary introductions. *Phase 1* helped me to focus the development of research questions and to build rapport with Council members and staff, SSC members, and fisheries-related stakeholders. In *Phase 2* I used semi-structured interviews with Council members, Council staff, and members of the Councils' SSCs to learn about what factors are perceived to influence representation of fisheries interests on the Council and how Council decisions are made, especially those related to ecosystem-based management (EBFM). In *Phase 3* I used quantitative methods, specifically a mail questionnaire, to collect data to study perceptions about EBFM between the Council members and staff, SSC members, and fisheries-related stakeholder groups in the New England (NE) and Mid-Atlantic (MA) regions.

2. Qualitative research methods

Qualitative research methods included observations of NEFMC and MAFMC meetings and workshops, review of documents and websites related to the Councils' organization, processes, and coverage of materials related to EBFM and interviews with Council members, staff, and SSC members.

2.1. Phase 1 (Exploratory): January 2011-February 2012

2.1.a. Goals

The first phase of research was an exploratory phase to learn about the responsibilities, organization, membership, and culture of the NEFMC and MAFMC and their respective SSCs, especially regarding their activities related to EBFM. Additional goals were to develop research questions and to build rapport with Council members and staff, SSC members, and fisheries-related stakeholders. The components of the exploratory phase included an information review, meeting observations, and preliminary introductions.

2.1.b. Information review

To gather contextual information about the Councils, including organizational structure, legal mandates underlying their creation and operation, procedures for appointment of staff and members, descriptions of Council members, past Council action related to EBFM, and Council culture, I reviewed literature, documents, and websites about Council and SSC organization and research, relevant fisheries and environmental legislation, and Council and SSC-generated reports, papers, agendas, and presentations. Both the NEFMC and the MAFMC websites provided thorough coverage of and open access to the types of documents listed above (Appendix A). I used this information to formulate research objectives relevant to current Council action regarding EBFM.

2.1.c. Meeting observations

I attended all MAFMC and NEFMC full council meetings held between April 2011 and December 2013 to gain a contextual understanding of Council dynamics, organizational structure, and major issues and themes, and toward the end of my research, to present the results of my research. Meeting observations informed interview and survey questions and, in the later stages of my research, allowed me to engage in outreach and education with the Councils by

sharing research results. During the meetings I sat with the public audience and recorded general notes about Council processes, opportunities for public input, and policy discussions and presentations related to ecosystem-based management (EBM) and EBFM. For the individuals that I recognized in the public seating area at the meetings, I noted the names of each person and the organizations she/he represented. I kept a running list of the individuals with whom I spoke during the meetings and related events, including Council and Council staff members, SSC members, individuals representing stakeholder organizations, and members of the public. In addition to attending Council meetings, I attended several Council-related workshops specifically about EBFM (Appendix B).

2.1.d. Preliminary introductions

I introduced myself and my research briefly during the exploratory phase of my research during public comment sections of both the NEFMC and MAFMC meetings. Additionally, I had informal conversations with many of the Council members, Council staff, SSC members, and fisheries-related stakeholders during breaks, meals, and designated networking sessions during the meetings. These social interactions gave me insight into potential social factors that could impede and/or facilitate the implementation of EBFM by the Councils and therefore informed the development of my research objectives. These interactions may have increased visibility of my research with Council members, staff, and SSC members, and therefore, potentially improved the response rate to invitations to participate in the interview phase of my research (Section *2.2.*). *Phase 1* of my research methods qualified for exemption from Cornell University IRB Review (IRB Protocol ID#: 1006001489) (Appendix C).

2.2. Phase 2 (Interviews): March 2012-July 2012

I used in-person and telephone interviews to gain insight to refine and address my research objectives. I interviewed MAFMC and NEFMC members and staff and members of the

Councils' SSCs to explore their individual perspectives related to the research questions, including identifying factors influencing the MAFMC and NEFMC's adoption of EBFM. The interviews also helped me to identify recurring themes that I explored more deeply with the mail questionnaire in *Phase 3*. *Phase 2* of my research methods qualified for exemption from Cornell University IRB Review (IRB Protocol ID#: 1006001489) (Appendix D).

Perspectives of Council staff were important to the study because staff members have a major role in the Council process, including conducting research and setting meeting agendas. Members of the SSC, who serve as scientific advisors to their respective Councils, provide scientific recommendations on fisheries about stock removal levels that Councils are mandated to follow, giving SSC members a powerful role in management decisions and making them a target for stakeholder input. However, although staff member and SSC member input is likely an important component of the Council decision-making process, their roles are not as directly connected to Council management decisions and action as Council members. Therefore, due to time and resource constraints associated with conducting interviews, not all Council staff and SSC members were invited to participate in interviews. Selection of Council staff and SSC members invited to participate in interviews was based on the relevance of their work to EBFM. Council member, Council staff, and SSC member contact information was available on the NEFMC and MAFMC websites. I distributed interview invitations initially via e-mail and followed up by phone and/or in person communications. I invited all NEFMC members (19) and specific NEFMC staff members (6) and SSC members (7) selected because of their experience with EBFM, and all MAFMC members (25) and specific MAFMC staff members (7), and SSC members (6) selected because of their experience with EBFM, and members of both Councils (4), totaling 74, to participate in interviews. However, not all individuals invited to participate accepted, resulting in 66 completed interviews.

To enroll interview participants, I invited NEFMC and the MAFMC members, Council staff members, and SSC members in person, by phone, and/or via e-mail. Initially, I asked potential participants if they would be willing to participate in an interview in person or via e-mail. If I received an in-person confirmation of willingness to participate, I sent a follow-up e-mail to schedule the interview. If I initially contacted the potential participant via e-mail, I included scheduling information in the initial e-mail. If I did not receive a response to my e-mail regarding scheduling, I made a follow-up phone call. Prior to in-person interviews, I e-mailed interview participants a reminder of the scheduled interview and an overview of the interview process and topics.

The interviews were semi-structured, contained approximately 8-10 questions, and lasted 30-60 minutes, depending on interviewee response duration (Appendix F). The interviews were structured to initiate conversation relating to the study objectives; however there was enough flexibility in the interview format to allow for unanticipated themes to emerge from the conversation. The interviews were open-ended, so for all the interviews, all questions may not have been asked in order nor read verbatim. The purpose of the questions was to provide an outline for the interview in order to structure discussion on the material/content that was essential to the study.

Interviews were conducted in person when possible, both at full Council meetings (during breaks or other non-meeting session times), at the Council staff's office, or at another practical location. If a face-to-face interview could not be arranged, interviews were conducted over the phone; 19 interviews were conducted by phone. I asked interviewees for permission to digitally record interviews, and I was prepared to document interviews with handwritten notes if the interviewee did not agree to be recorded. I took handwritten notes during one interview, and digitally recorded all others. Audio recordings and handwritten notes were later transcribed into

a data sheet, including follow-up comments from the discussion.

I used the computer software *Atlas.ti* (ATLAS.ti, 2014) to analyze interview data. *Atlas.ti* was used to code interview transcripts, which included highlighting transcript sections that suggested potential barriers to or recommendations for EBFM. After identifying the answers to the questions I had asked, I consolidated the codes into categories of barriers and recommendations. I took precautions in reporting, such as grouping of results, to protect the anonymity of interviewees.

3. Quantitative research methods

Following the exploratory and interview research phases, I used quantitative methods to pursue more detailed and in-depth study of the research questions that were developed in the qualitative research phase.

3.1. Phase 3 (Mail Survey): January 2013-April 2013

3.1.a. Goals

I developed a mail survey to explore components of the *Coorientation Model* and to collect quantitative data to address my second research objective, to characterize communication processes and understanding related to EBFM between Council members, SSC members, and stakeholders, including commercial fishermen, recreational anglers, and non-governmental organization (NGO) leaders, in the NE and MA regions. Specifically, data from the survey were used to analyze communication and to measure agreement, accuracy, and congruency between New England and Mid-Atlantic Council members and SSC members and fisheries-related stakeholder groups. The survey addressed how beliefs and attitudes of Council members about EBFM compared to SSC members' and fisheries-related stakeholders' perspectives of EBFM; if the Council members accurately predicted the perspectives of the SSC members and stakeholders; and if the Council members' management perspectives reflected SSC member and

stakeholder beliefs. Only stakeholders whose interests were related to federally-regulated fisheries within either the region regulated by the NEFMC or the MAFMC were included in the study.

Different forms of the mail survey were assigned to two categories for the purposes of studying Coorientation. The first group included Council members, Council staff members and SSC members. The second group included fisheries-related stakeholders, including commercial fishermen, recreational anglers, and NGO leaders. I measured agreement between the Council members and SSC members and Council members and each stakeholder group; the accuracy between the Council members and SSC members and Council members and each stakeholder group; and the congruency between the Council members and SSC members and Council members and each stakeholder group (Figure 1, Chapter 1). I only measured the accuracy and congruency of the Council members' estimates of each of the SSC members' and stakeholder groups' perspectives, and not vice versa, because the only the Council members vote on policy decisions about EBFM. *Phase 3* of my research methods qualified for exemption from Cornell University IRB Review (IRB Protocol ID#: 1006001489) (Appendix E).

Leong et al. (2008) used Coorientation to study communication between managers and stakeholders, increasing the scope of studying participatory efforts. The methodology that I used to test the Coorientation model during the study reflects the methodology used by Leong et al. (2008). I distributed mail surveys to Council members, Council staff and SSC members and to members of stakeholder groups, so I needed 2 survey types. Although I measured the individual perspectives of Council members, SSC members and stakeholders, the general relationships I measured were the aggregated attitudes of the Council members, SSC members, commercial fishermen, recreational fishers, and NGO leaders for both the NE and MA regions, similar to the approach previously used in another study (Connelly & Knuth, 2002).

3.1.b. Sample size

To calculate survey sample sizes for each stakeholder group, I used equations to calculate the "required sample size for accuracy level of +/- 5% for various population sizes (N=Inf.) and Confidence Levels (% of Population with Given Characteristic = 50%)," (Kish, 1965). In other words, I aimed for a sample size sufficiently large to say with 95% confidence that the true % for the population was within +/-5% if 50% of the population had that characteristic.

Based on the above calculations and assuming a 30% response rate based on similar studies (Connelly, 2013), a total of 5,621 cover letters and mail questionnaires were initially distributed to NE and MA regions. The initial number of surveys sent to each stakeholder group were: NEFMC and MAFMC members, staff, and SSC members (120); commercial fisheries (2,668); recreational anglers (2,728); and NGOs (105). I multiplied the initial survey mailing number, 5,621, by 1.9 to calculate the printing volume, which included enough surveys to accommodate several follow-up mailings.

Two versions of the mail survey were developed and distributed to study Coorientation. The first version, referred to as the "decision maker" survey, was sent to Council members, Council staff members, and SSC members from the NE and MA regions. The second version, referred to as the "stakeholder" survey, was sent to commercial fishermen, recreational anglers, and NGO leaders working on fisheries policy in the NE and MA regions. Five people were members of both the NEFMC and the MAFMC and received two surveys, each accompanied by an e-mail describing the situation and asking them to respond to both. Due to their central positions on the councils, the results could have skewed the data if each of these dual-council participants completed only one survey. From January 16, 2013 until March 1, 2013, up to 4 mailings were sent to selected NE and MA survey recipients. On January 16, 2014, a mail

survey and cover letter to describe the purpose of the survey were sent to selected survey recipients. Up to three follow-up mailings were sent to non-respondents to increase participation: a reminder letter (January 23, 2013), a reminder letter and questionnaire (February 6, 2013), and a final reminder letter (February 13, 2013) (Dillman, 1978).

3.1.c. Selecting survey recipients

Council members, staff members, and SSC members

I sent "decision maker" surveys to all Council members, Council staff members, and SSC members on both the NEFMC and MAFMC. I compiled Council member, staff member, and SSC member contact information from the NEFMC (NEFMC, 2014) and MAFMC (MAFMC, 2014) websites.

Commercial fishermen

To select the sample of survey recipients who are participants in the commercial fishing industry in the NE and the MA regions, I consulted a publicly accessible government-database (NERO, 2012). From the database, I compiled a list of individuals who were listed as holders of NOAA Fisheries Northeast Region Vessel Operator permits on the National Oceanic and Atmospheric Administration's website (as of 7/9/12) (NERO, 2012). Operators included in this database were required to have "operator cards": "Operator cards are required for any operator of a charter/party boat or a commercial vessel (including carrier and processor vessels) issued a vessel permit from the Northeast Region and possessing or fishing for Atlantic Sea Scallops, Northeast Multispecies, Spiny Dogfish, Monkfish, American Lobster, Atlantic Herring, Atlantic Surfclam, Ocean Quahog, Maine Mahogany Quahog, Atlantic Mackerel, Loligo Squid, Illex Squid, Butterfish, Scup, Black Sea Bass, Golden Tilefish, Skates, Atlantic Deep-Sea Red Crab, or Atlantic Bluefish, in or from the EEZ (NERO, 2012). There is a possibility

that those survey recipients selected from the "operators" list may not actually be commercial fishermen or currently operating their vessels. Once the list of current operators was compiled as described above, I sorted the operators by state and grouped operators into NE or MA regions. Names were designated as NE or MA regions based on if the state listed for their address was a state within New England (Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut) or the Mid-Atlantic (New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina) managed region. People with addresses with states listed outside of those regions were deleted from the lists. Then, separate lists for current operators for the NE and MA regions were created and each list was sorted by alphabetical order by last name and then first name. I randomly selected 1,334 names from each the NE region list and the MA region list to create the survey recipient list for commercial fishermen.

Recreational anglers

Marine recreational permitting lists are controlled by state governments, which release permitting information on a case-by-case basis. Within the NE and MA regions, only Virginia, Pennsylvania, Connecticut, and Massachusetts agreed to make their recreational permitting lists available for the study, and therefore, recreational angler survey responses represented only recreational permit holders from those states. Marine recreational fishermen were randomly sampled from the 2011-2012 state registries of registered marine recreational anglers from Pennsylvania, Virginia, Massachusetts, and Connecticut. These lists contained those residents and non-residents seeking a marine recreational fishing license for their respective state. Registrants under the age of eighteen were removed from data sets before sampling took place. The names in each state's database were listed in alphabetical order by last name, then first name. The

spreadsheets for Pennsylvania and Virginia contained data from combined years (2011-2012) and Massachusetts and Connecticut had separate sheets for 2011 and 2012, which were combined before sampling. The randomly selected samples for each of the 4 states were selected from the combined 2011 and 2012 data. However, I checked to confirm that I did not sample the same name twice.

Priority Recreational Anglers

In addition to the registered marine recreational angler survey recipients, I sent surveys to a group of recreational anglers who I characterized as "Priority Recreational Anglers." This stakeholder group included people with interests in marine recreational angling and party/charter boat operations who were likely to be more active in the MAFMC and NEFMC process than the typical recreational angler on the state-provided lists of recreational anglers. The lists of "Priority Recreational Anglers" were acquired from the following three sources:

- A list compiled by the NEFMC staff of people involved in marine recreational fishing or charter/party enterprises who had expressed an interest in being engaged with the Council.
- A list provided by a MAFMC staff member of the people the Council interacts with most regarding marine recreational angling and who participated in a recent focus group organized by the Council staff.
- Sign-in sheets for both the MAFMC and the NEFMC meetings that contained contact information for individuals that fit the description of "Priority Recreational Anglers."

Non-governmental organization leaders

I compiled a list of leaders of marine fisheries organizations, mostly NGOs, in the NE and MA regions. Only a small number of NGO leaders fit the criteria for the survey, so

all NGO leaders that I identified were survey recipients. To identify survey recipients for the stakeholder group labeled "NGO Leaders," I conducted an internet search for "non-governmental organizations in New England fisheries" and "non-governmental organizations in Mid-Atlantic fisheries." Although in my search I focused on environmental NGOs, my overall sample included leaders from environmental NGOs related to marine fisheries in New England and the Mid-Atlantic, but also to other organizations related to marine fisheries in New England and the Mid-Atlantic. Once I identified an organization that met the search criteria, I looked for the contact information for either the leader of the organization, or the person who was most directly related to marine fisheries for the organization, and included that person in my sample. Additionally, I reviewed sign-in sheets from NEFMC and MAFMC full meetings from 2011 and 2012 and reviewed my notes from meeting observations and included the representatives of marine fisheries-related organizations listed on the sign-in sheets or in my notes as survey recipients. I also used contact lists provided by the Council staff members to identify leaders of marine fisheries organizations in the NE and MA regions.

3.1.d. Survey content

The key survey questions are listed in Appendix G. The full versions of the NE and MA surveys for both Council decision makers and stakeholders are included in Appendices H, I, J, and K.

3.1.e. Non-respondent phone follow-up

To evaluate non-respondent bias, I conducted non-respondent phone follow-up data collection, consisting of a shortened version of the mail survey conducted by telephone, from March 28, 2013 through April 16, 2013, (Loker, Decker, & Schwager, 1999; Tarrant, Manfredo, Bayley, & Hess, 1993). I did not include Council members and NGO leaders in the non-

respondent phone follow-up surveys because these group sizes were small initially. The Survey Research Institute at Cornell University (SRI) conducted the non-respondent telephone survey follow-up. I provided SRI with a sample of 4,040 non-respondent fisheries stakeholders representing the four strata (two fishing regions and two types of permits). SRI randomly selected a total of 1,411 stakeholders from across all four strata combined for the follow-ups. SRI attempted Lexis-Nexis lookups (using names and addresses) for the 1,032 of the 1,411 randomly sampled stakeholders whose records did not include a phone number. Overall, from the 1,411 randomly selected stakeholders, by combining the stakeholders whose records initially included phone numbers and those stakeholders whose phone numbers were found using Lexis-Nexis, SRI's final working sample of possible non-respondents to contact by phone was 1,033. SRI completed the target number of non-respondent surveys, a total of 200 phone interviews (50 NE commercial fishermen, 50 NE recreational anglers, 50 MA commercial fishermen, and 50 MA recreational anglers). To analyze the results from the non-respondent phone follow-ups, we used a *Chi-square test for association* (*Pearson Chi-Square* was used since neither variable was dichotomous) in SPSS (Corp., 2012) to compare the survey responses between the initial survey response group and the non-response group to determine if survey group was statistically independent of survey response at the $P < 0.05$ level.

3.1.f. Survey data analyses

I entered the data from the returned questionnaires into a computerized data file and used SPSS (IBM SPSS Statistics 21) for analysis. I conducted a *Two-Way Analysis of Variance*. I checked the standard assumptions (Ltd, 2013) and found them reasonable and consistent throughout the analysis. I used the results of the *Two-Way Analysis of Variance* to calculate agreement, accuracy, and congruency between Council members and SSC members and stakeholders.

For the purposes of this study, "agreement" was defined as "the extent to which the organization and the public hold the same attitudes and beliefs" (Leong, McComas, & Decker, 2008), where the "Organization" represents the Council members and "the public" represents SSC members and stakeholders. To calculate *Agreement Level* between Council members and one of the relevant stakeholder groups from the appropriate region, I calculated the mean survey responses for each stakeholder group to each question. All survey responses were measured on a Likert scale of 1-5 (6's, "Don't Know" responses were removed from the data set for analysis). I then calculated the absolute value of the difference in mean response between the two groups. The maximum possible difference in mean response was 4, which would represent the lowest possible agreement. The minimum difference in mean response was 0, which would be complete agreement. To represent *Agreement Level* as directly correlated to agreement, *Agreement Level* was calculated by subtracting the absolute value of the mean response difference from 4. Therefore, 4 = highest *Agreement Level* and 0 = lowest *Agreement Level (AGREEMENT LEVEL = {4 - (Absolute value of mean response difference)})*.

For the purposes of this study, "accuracy" was defined as "the extent to which the organization's or the public's estimate of the other's attitudes and beliefs is similar to the other's actual attitudes and beliefs" (Leong et al., 2008), where the "Organization" represents the Council members and "the public" represents SSC members and stakeholders. To calculate *Accuracy Level* between Council members and one of the relevant stakeholder groups from the appropriate region, I calculated the mean survey responses for each stakeholder group to each question as well as Council member mean predictions of each stakeholder group's responses to each question. I then calculated the absolute value of the difference in the mean prediction of Council members for the stakeholder group in question and the mean response of the stakeholder group. The maximum possible difference in mean response was 4, which would represent the

lowest possible accuracy. The minimum difference in mean response was 0, which would be complete accuracy. To represent *Accuracy Level* as directly correlated to accuracy, *Accuracy Level* was calculated by subtracting the absolute value of the mean response difference from 4. Therefore, 4 = highest *Accuracy Level* and 0 = lowest *Accuracy Level* (*ACCURACY LEVEL = {4 - (Absolute value of mean response difference)}).*

For the purposes of this study, "congruency" was defined as "the extent to which the organization's or the public's estimate of the other's attitudes and beliefs is similar to their own" (Leong et al., 2008), where the "Organization" represents the Council members and "the public" represents SSC members and stakeholders. To calculate *Congruency Level* between Council members and one of the relevant stakeholder groups from the appropriate region, I calculated the mean survey responses of Council members to each question as well as Council member mean predictions of each stakeholder group's responses to each question. I then calculated the absolute value of the difference in the mean prediction of Council members and the mean response predicted for the stakeholder group in question. The maximum possible difference in mean response was 4, which would represent the lowest possible congruency. The minimum difference in mean response was 0, which would be complete congruency. To represent *Congruency Level* as directly correlated to congruency, *Congruency Level* was calculated by subtracting the absolute value of the mean response difference from 4. Therefore, 4 = highest *Congruency Level* and 0 = lowest *Congruency Level (CONGRUENCY LEVEL = {4 - (Absolute value of mean response difference)}).*

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CHAPTER 3

BARRIERS TO AND RECOMMENDATIONS FOR NEW ENGLAND AND MID-ATLANTIC FISHERY MANAGEMENT COUNCIL TRANSITION TO ECOSYSTEM-BASED FISHERIES MANAGEMENT

ABSTRACT

Ecosystem-based fisheries management (EBFM) is being considered as a potential alternative to single species fisheries management (SSFM) in the New England (NE) and Mid-Atlantic (MA) regions of the United States as a number of policy developers, scientists, and managers acknowledge that the SSFM approach practiced under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (Commerce, 2007) may not be sufficient to meet fisheries management objectives (Botsford, Castilla, & Peterson, 1997; Field & Francis, 2006). The purpose of our study was to improve understanding of perceived barriers to and recommendations for EBFM among key Council participants, particularly related to social dimensions reflecting the *Planning Table* concepts of access, representation, power, and interests. We observed 32 Council meetings and interviewed 66 individuals, including Council members, Council staff members, and Scientific and Statistical Committee (SSC) members in the NE and MA regions, about EBFM. Overall the study demonstrated that science, human dimensions, policy, and practice are important considerations for Council transition to EBFM, both pertaining to overcoming barriers to EBFM and for developing implementation plans for EBFM.

Keywords: ecosystem-based fisheries management, New England Fishery Management Council, Mid-Atlantic Fishery Management Council, Planning Table

1. Introduction

1.1. Overview

Ecosystem-Based Fisheries Management (EBFM) is being considered as a potential alternative to single species fisheries management (SSFM) in the New England (NE) and Mid-Atlantic (MA) regions of the United States as a number of policy developers, scientists, and managers acknowledge that the SSFM approach practiced under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (Commerce, 2007) may not be sufficient to meet fisheries management objectives (Botsford et al., 1997; Field & Francis, 2006). The MSFCMA is the primary legislation regarding marine fishing in the federal United States (U.S.) exclusive economic zone. EBFM, a component of the broader concept of Ecosystem-Based Management (EBM), a holistic approach to wildlife and fisheries management (McLeod & Leslie, 2009), is a management approach that many stakeholders, including fisheries managers and fishermen, have explored as an approach to fisheries management. EBFM has been defined as the process of "managing fisheries to coordinate, account for, and include all factors in a holistic, synthetic, integrated fashion" (Link, 2010). A distinguishing feature of EBFM is that it is based on a multi-species approach, which varies significantly from the single species fisheries management (SSFM) approach currently practiced under the MSFCMA. Several key reports, including the U.S. Commission on Ocean Policy's *An Ocean Blueprint for the 21st Century* (USCOP, 2004) and the PEW Ocean Commission's *America's Living Oceans: Charting a Course for Sea Change* report (Commission, 2003), in addition to President Obama's *National Ocean Policy* (CEQ, 2010), have encouraged using EBM as an overarching approach to marine policy, including fisheries management. In practice, the Councils have followed an institutional precedent to practice SSFM under the MSFCMA; however, the MSFCMA is currently undergoing reauthorization, which may result in changes that would more explicitly mandate the

use of EBFM under amended legislation.

When the U.S. Congress enacted the Fishery Conservation and Management Act (FCMA) in 1976 (the precursor to the MSFCMA) (Commerce, 2007), it designated the creation of eight regional fishery management councils within the U.S. The FCMA/MSFCMA granted Councils the authority to identify which fisheries needed management and to develop fisheries management plans, amendments, and suggested regulations to manage the selected fisheries within their respective regions (McLeod & Leslie, 2009). The South Atlantic, Gulf of Mexico, Mid-Atlantic, New England, Western Pacific, North Pacific, and Pacific regional fishery management councils are carrying out some level of EBFM planning or implementation (Dereynier, 2012). The Caribbean Fishery Management Council is currently working to transition from SSFM to island-based fishery management plans (CFMC; Member, 2014). Previous efforts to transition from SSFM to EBFM have been slow, bureaucratically laborious, or nonexistent (Francis, Hixon, Clarke, Murawski, & Ralston, 2007), but over the last several years, both the New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC) have moved toward creating plans to implement EBFM. The MAFMC, in response to the feedback it received during its *Visioning Project* (MAFMC, 2012b) with stakeholders, is moving forward to develop a plan to implement an Ecosystem Approach to Fisheries Management (EAFM) Guidance Document (MAFMC, 2012a, 2012b). During 2013, the NEFMC suspended progress toward its 2008 decision to develop a plan for and to implement EBFM. In 2014, the NEFMC voted to include EBFM on its 2014 priority list as a multi-year task, and the Council has held two Ecosystem-Based Management Committee meetings to date in 2014.

The purpose of our study was to improve understanding of perceived barriers to and recommendations for EBFM among key Council participants, particularly related to social

dimensions reflecting the *Planning Table* concepts of interests, access, representation, and power. We observed 32 Council meetings and interviewed 66 individuals, including Council members, Council staff members, and Scientific and Statistical Committee (SSC) members in the NE and MA regions, about EBFM. We explored what Council participants perceived as potential barriers to EBFM and solicited their recommendations regarding the implementation of EBFM.

1.2. Theoretical framework: The Planning Table

We framed the Council interviews about EBFM in relation to the theoretical concept of the *Planning Table* (Cervero & Wilson, 2006), focusing on fishery management Council representation, interests, access and power. The notion of "working the *Planning Table*," considers whose interests are voiced, acknowledged, and incorporated into planning decisions (Cervero & Wilson, 2006). In the *Planning Table* context, interests are described as "predispositions, embracing goals, values, desires, and other orientations and inclinations that lead a person to act in one direction or another" (Morgan, 1997) and "the motivations and purposes that lead people to act in certain ways when confronted with situations in which they must make a judgment about what to do or say" (Cervero & Wilson, 2006). The central idea of the planning table is negotiating power and interests (Wilson, 2014).

Although much of the *Planning Table* discussion in the literature is in the context of educational program planning, the theory has relevance to wildlife planning and management issues, including those dealt with by the Councils because the Councils comprise groups of members assigned the responsibility to develop fishery management plans which reflect the needs of their constituents. The social dimensions of some of the barriers and recommendations mentioned by fishery management council interviewees relate back to concepts of the *Planning Table*, including who is involved, who should be involved, and how various interests are

considered in the Council decision-making process. Therefore, the conceptual basis of the *Planning Table* approach offers insights that are applicable to research about Council implementation of EBFM. Other natural resources studies have applied the *Planning Table* theory. For example, Raik and Wilson (2005) studied the influence of power and interest on the wildlife management planning process in order to improve understanding of the influence that political interests have on wildlife management. In both the Raik and Wilson study and this study, interactions between managers and government, resource users, business, and citizens are monitored to better understand the human dimensions factors that affect the wildlife planning process (Raik, 2006).

For this study, we used the concept of the *Planning Table* to examine and analyze the complexities of multiple-party involvement in Council processes. The complicated nature of the "Who is at the table" question for Councils provided an opportunity to study how the roles of multiple parties in the Council organization, including Council members, Council staff members, and SSC members, influence Council management decisions. Meeting observations allowed us to closely study the impacts of multiple-party involvement in Council processes while interviews provided a focused study of the interests of those at the Council table.

"Who is at the table?" is one of the theory's main themes, referring to who has the political, financial, informational, historical, and/or cultural means to gain access to the policy discussion, or "a seat at the table" (Cervero & Wilson, 2006). The *Planning Table* theory posits that for an individual's or group's interests to be addressed and incorporated into a final management plan, each individual or group must have a seat at the metaphorical or literal *Planning Table* (Cervero & Wilson, 2006). Having a seat at the table provides the participant with an opportunity to express her/his interests or her/his constituents' interests in an issue, and maximally, allows the participant to gain the greatest advantage for her/his and or her/his group's

interests in the organizational decisions made during the conversation. Additionally, the ability "to gain the greatest advantage" is influenced by the characteristics of the debate between interests and on the power of whoever is representing those interests (Wilson, 2014). Who is at the table?" in the context of Council action toward EBFM may be posed as "Who are the members of the Council?" or "Which parties have access to Council decision-making discussions?"

"Who benefits?**"** is another of the theory's main themes, addressing whether the individual or group represented at the table has the power to gain traction and prioritization of her/his interests, or whether those who gain access to the table have a voice in the decision making process once seated at the table (Cervero & Wilson, 2006). Factors influencing power-dynamics include money, politics, history, and credibility. The word "ability" can also be substituted for the word "power." Those with the best ability to exert pressure on the others at the table and/or convince others to support their interests will most likely have their interests addressed. The question, "Who benefits?" could be rephrased for the context of Council action toward EBFM as "Which members'/user groups' interests are prioritized by the Council?" and "Who are non-member stakeholders who have access to and can influence the votes of the members who are actually at the table?"

"What for?" is a third tenet of the *Planning Table* theory, seeking explanations for why some interests are acknowledged in final management decisions while others are not pursued by the organization. Factors that may influence what interests are addressed include Congressional and state mandates and/or legislation, priorities of the organization, including public versus individual needs, individual preferences and values, funding, and/or management time lines. The "What for?" question creates a big picture perspective to identify how the decisions that organizations make are justified (Cervero & Wilson, 2006). Council members vote on Council

actions to fulfill the Council mandates to manage the region's fisheries, including decisions about EBFM. A variety of factors could influence votes on Council issues, including responsibilities to constituents, pressures from appointing bodies, personal interests, Council precedent, Council seniority, and understanding of scientific information.

The focus of this study on barriers to and recommendations for EBFM implementation reflects the *Planning Table* concepts related to interests, access, representation, and power. The social aspects of many of the barriers and recommendations mentioned by interviewees relate to the *Planning Table* by highlighting the components of the Council process that affect which stakeholders have a voice in the fishery management process, which groups' voices are heard, and which groups' interests are addressed in final management decisions.

1.3. Research objectives

The purpose of our study was to characterize how Council members, Council staff members, and SSC members perceived potential barriers to EBFM and recommendations for implementing EBFM, particularly related to social dimensions reflecting the *Planning Table* concepts of interests, access, representation, and power. We interviewed 66 individuals, who were Council members, Council Staff members, or SSC members in the NE and MA regions, about EBFM. Qualitative research methods included observations of 15 NEFMC and 17 MAFMC meetings and 3 workshops, a review of documents and websites related to the Councils' organization and processes, and interviews with Council members, staff, and SSC members.

2. Methods

2.1. Overview

We used an exploratory approach to learn about NEFMC and MAFMC members, Council staff members and SSC members, including a document review and meeting

observations. This approach helped us to focus the development of interview questions. We used semi-structured interviews to identify Council participant perceptions of barriers to EBFM and recommendations regarding EBFM implementation.

2.2. Exploratory approach: January 2011-February 2012

2.2.a. Information review

To gather contextual information about the Councils, including organizational structure, legal mandates underlying their creation and operation, procedures for appointment of staff and members, descriptions of Council members, past Council action related to EBFM, and Council culture, we reviewed literature, documents, and websites about Council and SSC organization and research, relevant fisheries and environmental legislation, and Council and SSC-generated reports, papers, agendas, and presentations. Both the NEFMC and the MAFMC websites provided thorough coverage of and open access to information (Appendix A). The information review and meeting observations were used to develop the interview questions (Appendix F).

2.2.b. Meeting observations

We attended all MAFMC (17) and NEFMC (15) full council meetings held between April 2011 and December 2013 to gain a contextual understanding of Council dynamics, organizational structure, and major issues and themes, and toward the end of the research, to present the results of the research. During the meetings we sat with the public audience and recorded general notes about Council processes, opportunities for public input, and policy discussions and presentations related to EBM and EBFM. During the meetings, we had informal conversations with many of the Council members, Council staff, SSC members, and fisheries-related stakeholders during breaks, meals, and designated networking sessions. These social interactions provided insight into potential social factors that could impede and/or facilitate the implementation of EBFM by the Councils. In addition to attending Council meetings, we

attended several Council-related workshops specifically about EBFM (Appendix B). The information review and meeting observation research methods qualified for Exemption from Cornell University IRB Review (IRB Protocol ID#: 1006001489) (Appendix C).

The interviews were conducted to identify issues key Council participants perceived as barriers to EBFM and to solicit their recommendations for Council transition to EBFM. The interview format allowed a deeper exchange of information, including exploring the Council members' perceptions of the individual players' roles in the Council process and how each of those roles influenced the Councils' work regarding EBFM. The meeting observation data provided a basis for understanding the Councils' cultures to inform development of the interview questions (and survey questions for an additional component of the study; see Chapters 4 and 5). Additionally, the meeting observations provided context within which to understand the responses Council participants provided during interviews.

2.2.c. Interviews: March 2012-July 2012

We interviewed MAFMC and NEFMC members and staff and members of the Councils' SSC's. The interviews qualified for Exemption from Cornell University IRB Review (IRB Protocol ID#: 1006001489) (Appendix D).

Council staff and SSC members with expertise related to EBFM were invited to participate in interviews. Council member, Council staff, and SSC member contact information was available on the NEFMC and MAFMC websites. We distributed interview invitations initially via e-mail and followed up by phone and/or in person communications. We invited all NEFMC members (19) and selected NEFMC staff members (6) and NEFMC SSC members (7), and all MAFMC members (25) and selected MAFMC staff members (7) and MAFMC SSC members (6), and members of both Councils (4), totaling 74, to participate in interviews; 66 individuals completed interviews.

Interviews were semi-structured (Keyton, 2006), contained approximately 8-10 questions, and lasted 30-60 minutes, depending on interviewee response duration. The interviews were structured to initiate conversation relating to the study objectives; however there was enough flexibility in the interview format to allow for unanticipated themes to emerge from the conversation. The interviews were open-ended, so for all the interviews, all questions may not have been asked in order nor read verbatim. The purpose of the questions was to provide an outline for the interview in order to structure discussion on the material/content that was essential to the study.

Interviews were conducted in person when possible, both at full Council meetings (during breaks or other non-meeting session times), at the Council staff's office, or at another practical location. If a face-to-face interview could not be arranged, interviews were conducted over the phone; 19 interviews were conducted by phone. We asked interviewees for permission to digitally record interviews. Audio recordings were later transcribed.

We used the computer software *Atlas.ti* (2014) to analyze interview data. *Atlas.ti* was used to code interview transcripts, which included highlighting transcript sections that suggested potential barriers to or recommendations for EBFM (ATLAS.ti, 2014). After identifying the answers to the questions we had asked, we consolidated the codes into categories of barriers and recommendations. We took precautions in reporting, such as grouping of results, to protect the anonymity of interviewees.

3. Results

3.1 Meeting observations

3.1.a. Meeting observation overview

The meeting observations are discussed below and organized by the *Planning Table* concepts: "Who is at the table?"; "Who benefits?" and "What for?" The meeting observations

provided insight into the Councils' cultures and the context within which to situate the responses Council participants provided during interviews.

3.1.b. Who is at the table?

Fishery Management Council members are assigned to the Council in two ways. The first process by which Council members are assigned is as state or federal representatives of his/her respective state or of the National Oceanic and Atmospheric Administration (NOAA) or the National Marine Fisheries Service (NMFS). "The Regional Administrator of NMFS (or his/her designee)" the NOAA/NMFS Assistant Regional Administrator, is appointed as a representative of NOAA/NMFS (NEFMC, 2014). "The principal state official with marine fishery management responsibility (or her/his designee)" for each state within the respective Council's region (NEFMC, 2014) is also a member of the respective Council. These state officials, or their designees, are the heads of the department within their respective state that manages marine fisheries. This process allows the governmental management departments responsible for marine fisheries management within each state to be represented.

Members are also nominated by the governors of the states included in the Council's region and then appointed by the Secretary of Commerce for three-year terms. Appointed members may serve a maximum of three consecutive terms (Commerce, 2007). The number of appointed At-Large and Obligatory Council members is relative to the size of the state. The MSFCMA mandates that collectively, the appointed members should represent a range of stakeholders, including commercial fishermen and recreational anglers (Commerce, 2007).

There are also non-voting members on the Council, including the Executive Director or his/her designee of the Atlantic States Marine Fisheries Commission (ASMFC), a representative of the U.S. Coast Guard, a representative from the NMFS Northeast Fisheries Science Center (NEFSC), and a NOAA General Counsel who advises each Council on legal matters. In addition

to the non-voting members mentioned above, the MAFMC includes representatives of the U.S. Fish and Wildlife Service, NOAA Law Enforcement, and U.S. Department of State (NEFMC, 2014).

Though not Council members, Council staff members fill both administrative and scientific roles to support Council activities and play an integral role in informing and supporting Council decisions. Council staff members organize the agenda for all Council meetings, facilitate communication with stakeholders, and prepare fishery management plans for presentation to the Council for consideration. By setting the agenda, which includes management measures, science and research presentations, and public input sessions for each meeting, staff members control which stakeholders have access to the table during Council meetings.

SSC members, who are nominated and then approved by Council members, serve renewable three year terms (NEFMC, 2012) and advise the Council on scientific matters for which their input is solicited by the Council. Under the reauthorized MSFCMA, the SSC is mandated to: "Assist it (Council) in the development, collection, evaluation, and peer review of such statistical, biological, economic, social, and other scientific information as is relevant to such Council's development and amendment of any fishery management plan" (MAFMC, 2014a). The influence of the SSC has increased significantly since the 2006 reauthorization of the MSFCMA, which requires that the SSC provide the Councils with "acceptable biological catch" for each stock managed by the SSC's respective Council (Commerce, 2007; MAFMC, 2014a).

3.1.c. Who benefits?

Theoretically, most stakeholder groups, including commercial fishermen, recreational anglers, NGOs, and state and federal governments, should be represented by the Council process. The NOAA Regional Administrator acts on behalf of the Secretary of Commerce who is

responsible for determining if fishery management plans or amendments are consistent with the *National Standards* and other parts of the MSFCMA and any other applicable law (Commerce, 2007). One of the purposes of the MSFCMA is "to provide for the preparation and implementation, in accordance with the *National Standards*, of fishery management plans which will achieve and maintain, on a continuing basis, the optimum yield from each fishery" (Commerce, 2007). "Optimum" is defined, with respect to yield from a fishery, as "the amount of fish which – (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; (B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factors; and (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery" (Commerce, 2007). The challenge the Council process faces is that at times the purposes of the MSFCMA, here, specifically the greatest overall benefit of marine ecosystems and harvesting the maximum sustainable yield are perceived as at odds by some stakeholders.

The NOAA/NMFS Regional Administrator, acting on behalf of the Secretary of Commerce, has the legal authority to approve, deny, or approve with recommended changes any fishery management plan that the Councils pass. Therefore, the final decision, and some stakeholders may say the final priorities of fisheries management, are decided by NOAA Fisheries, or by the federal government, which is charged with managing fisheries resources for "the greatest overall benefit to the Nation." However, one observation that supports the perspective that Councils do have an influential role in the development of the fishery management plans for the stocks that they manage is that although the NOAA/NMFS Regional Administrator, which makes final approval decisions about fishery management plans voted on

by the Council, is the same for both the MAFMC and the NEFMC, each Council's fishery management plans differ, demonstrating that Council influence does impact fishery management plans uniquely for each Council.

3.1.d. What for?

The Council process was mandated by the MSFCMA to allow stakeholder input and representation in the regional federal marine fisheries management process. Currently, the MSFCMA is designed to manage federal marine fisheries to "to provide for the preparation and implementation, in accordance with the *National Standards*, of fishery management plans which will achieve and maintain, on a continuing basis, the optimum yield from each fishery" (Commerce, 2007). The Council process strives to meet this mandate, though this study suggests that stakeholders perceive varying level of success in achieving this objective and meeting the other *National Standards* listed in the MSFCMA. Based on meeting observations, it appears that fisheries management policy developed by the Councils and approved by the Regional Administrator is driven by whether the plans are legally defensible if NOAA/NMFS were sued by the commercial fishing industry, recreational anglers, NGOs, or other parties for not abiding by the regulations of the MSFCMA.

3.1.e. Observed stakeholder interests

Stakeholder "interests" regarding EBFM observed during meeting observations could be grouped into four categories, the same categories the interview responses are grouped into: *science*, *human dimensions*, *policy*, and *practice*. Some scientists reported that there are enough credible scientific studies, data, and models for EBFM to progress. Additionally, sometimes other Council stakeholders implied that the barrier *Lack of science, data, and modelling capability* is used as a stalling strategy to delay Council transition to EBFM. Some interviewees believed that EBFM is supported under the MSFCMA. A large percentage of interviewees had

the impression that the socioeconomic information required to make holistic management decisions and mandated under *National Standard #4*, (*Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges*), and *National Standard #8*, (*Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of paragraph (2), in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities*) (Commerce, 2007), is not available. Some interviewees desired more certainty for the effects of EBFM on regulations, economics, and jobs than was offered by NMFS or the Councils. Many interviewees would prefer more surveys and more inclusion of stakeholder input before Council decisions are made.

3.2. Interview results

3.2.a. Interview results overview

The interview data demonstrated the interests of those stakeholders who participated in the *Planning Table* discussions. Interviewees identified 29 barriers to EBFM (Table 2) and suggested 14 recommendations for approaching implementation challenges to EBFM (Table 3). The interview responses for "barriers to EBFM" and "recommendations for EBFM" were separated into four categories: *science*, *human dimensions*, *policy*, and *practice*."

Table 2. Potential barriers to EBFM mentioned during interviews, organized by interest category, and ordered by citation. "Citation" is the number of interviews in which a certain barrier was mentioned at least once.

Barriers	Interest categories	Citation
Lack of science, data, and modelling capability	Science	50
Uncertainty in EBFM science and management impacts	Science	13
Difficulty defining ecosystem boundaries	Science	11
Non-fishing activity harm to fisheries	Science	5
Lack of Council request for EBFM science and guidance from SSC	Science	3
Lack of scientist support	Science	2
Need socioeconomic information	Human Dimensions	43
Lack of stakeholder engagement	Human Dimensions	22
Reluctance to change	Human Dimensions	22
Lack of stakeholder buy-in	Human Dimensions	20
Lack of evaluating tradeoffs	Human Dimensions	19
Fishery management council in management crisis mode	Human Dimensions	12
Politics	Human Dimensions	12
EBFM is overwhelming	Human Dimensions	8
Lack of communication	Human Dimensions	8
Market demands for fish	Human Dimensions	7
Lack of Council and manager support	Human Dimensions	6
Identifying stakeholders	Human Dimensions	4
Lack of leadership on EBFM	Human Dimensions	3
Humans lack control over nature	Human Dimensions	3
EBFM is constrained by the Magnuson-Stevens Fishery Conservation and Management Act; EBFM is not legally mandated	Policy	44
Lack of funding for EBFM	Policy	29
Governance	Policy	28
Lack of staff and manager time	Policy	19

Uncertainty of management regulations under EBFM	Policy	4
Lack of goals and an implementation plan for EBFM	Practice	28
Lack of universally accepted definition of EBFM	Practice	21
Difficult to enforce and evaluate	Practice	5
Lack of pilot studies	Practice	3

Table 3. Recommendations for EBFM mentioned during interviews, organized by interest category, and ordered by citation. "Citation" is the number of interviews in which a certain recommendation was mentioned at least once.

Recommendations	**Interest categories**	**Citation**
The fishery management councils and leaders should look to the SSC and the science center for science and models that would support EBFM	Science	11
Increase understanding of ecosystems to prepare for long-term ecosystem changes	Science	9
Develop buy-in with all stakeholders about EBFM	Human Dimensions	11
Evaluate tradeoffs of EBFM plans	Human Dimensions	7
Include social and economic factors into EBFM	Human Dimensions	5
EBFM needs leaders in the field to advocate its strengths and spearhead its implementation	Human Dimensions	3
Consider removals based on a biomass cap	Policy	10
Practice EBFM as supported by some Magnuson-Stevens Fishery Conservation and Management Act National Standards	Policy	8
Improve governance for EBFM	Policy	6
Define EBFM, identify objectives, and determine specific plan and time line for implementation	Practice	26
Transition to EBFM incrementally	Practice	16
Implement EBFM on an experimental or pilot study scale, observe outcomes, and adapt management as necessary	Practice	12
Practice EBFM based on spatial management (ecosystem production units)	Practice	11
Use a management approach which includes both SSFM and EBFM	Practice	5

3.2.b. Planning Table and barriers to the implementation of EBFM

A number of the barriers identified by interviewees are relevant to one or more components of the *Planning Table*, especially for the component "Who is at the table?" and the complexities of multiple-party involvement in Council matters including: *Lack of science, data, and modelling capability*; *Need socioeconomic information*; *Lack of stakeholder engagement*; *Lack of stakeholder buy-in*; *Lack of evaluating tradeoffs*; *Difficult to enforce and evaluate*; *Non-fishing activity harm to fisheries; Lack of Council request for EBFM science and guidance from SSC;* and *Lack of scientist support* (Table 2).

The barriers listed below had the majority of interviewees suggesting them: *Lack of science, data, and modelling capability*, *EBFM is constrained by the Magnuson-Stevens Fishery Conservation and Management Act/EBFM is not legally* mandated, and *Need socioeconomic information* (Table 2). Some commonalities between these barriers are that major institutional changes or significant time and effort would be needed to overcome them, but under certain political and socioeconomic circumstances, these barriers could be surmountable. The barriers *Lack of Council request for EBFM science and guidance from SSC* and *Lack of pilot studies* were rarely mentioned but offer tangible steps to overcome barriers to EBFM (Table 2).

3.2.c. Planning Table and recommendations for the implementation of EBFM

A number of the recommendations identified by interviewees are relevant to one or more components of the *Planning Table*, especially for the component "Who is at the table?" and the complexities of multiple-party involvement in Council matters including: *Develop buy-in with all stakeholders about EBFM; The fishery management Councils and leaders should look to the SSC and the science center for science and models that would support EBFM; Evaluate tradeoffs of EBFM plans; Include social and economic factors into EBFM;* and *EBFM needs leaders in the field to advocate its strengths and spearhead its implementation* (Table 3).

The recommendation *Define EBFM, identify objectives, and determine specific plan and time line for implementation* was mentioned by the highest number of interviewees of all the recommendations. *Transition to EBFM incrementally* and *Implement EBFM on an experimental or pilot study scale, observe outcomes, and adapt management as necessary* were suggested as recommendations by the second and third highest number of interviewees, respectively.

4. Discussion

4.1. Overview

The meeting observations, document review, and interviews provided information to contextualize Council participant perceptions about barriers to and recommendations for the implementation of EBFM in the context of the *Planning Table* and EBFM implementation. A potential limitation of our methods was that the interview approach included only some Council stakeholders. Although commercial fishermen, recreational anglers, and environmental non-governmental organizations play a role in Council management decisions, the interviews were held with only Council members, Council staff members, and SSC members because these individuals have formalized connections with the Council and because the time-intensive nature of conducting and analyzing interviews required us to limit the number of interviews we conducted. However, Council members are expected to represent non-Council members' interests (Commerce, 2007). Through the interview process, generally, it seemed that Council members attempted to accurately and faithfully represent non-Council members' interests, especially those of the constituencies they themselves were most associated with. Some of the barriers and recommendations presented in the tables contradict themselves due to the fact that some interviewees mentioned practices that are opposed to each other. For example, one recommendation was *Consider removals based on a biomass cap*, which is a dramatic form of a transition to EBFM, while another was *Transition to EBFM incrementally*, which is a gradual

transition to EBFM (Table 3).

The meeting observations and interviews completed for this study provided insight about the parties at the "Council *Planning Table*." For example, the perceived barrier *Lack of science, data, and modelling capability* (Table 2) suggests that there is a lack of scientific information about EBFM being conveyed to Council members, staff members, and SSC members, which may indicate that more scientists with expertise in EBFM should be included in the Council decision-making processes (i.e. as a voting Council member or SSC member). Meeting observations and interviews also provided insight into which Council participants' voices are heard during the Council process. For example, perspectives of Council staff were important to the study because staff members have a major role in the Council process. Even though Council staff members do not vote, their scientific work and organizational duties, including conducting research and setting meeting agendas, one of the most significant though perhaps overlooked powers on the Council, make them powerful participants in the Councils' proceedings. The setting of agendas designates which stakeholders will participate and be heard during each meeting. These responsibilities may provide staff members with the power to use their position and skills to effectively promote certain Council interests while excluding others (Wilson, 2014). Staff members, especially those who had been employed as Council staff for a number of years, seemed to value their work as important to the functioning of the Council and its complex mandates, but they also seemed to hold a sense of service to the Councils and seemed dependent on the attitudes and preferences of the Council leadership, including the Council Chairperson and the Executive Director, who is a member of the staff. Council staff also seemed to feel the effectiveness or use of their work was dependent on the political mood regarding regulation and political leadership.

Members of the SSC, who serve as scientific advisors to their respective Councils, are

required to provide scientific recommendations on fisheries about stock removal levels that Councils are mandated to follow, giving SSC members a powerful voice in management discussions. Interviews with Council participants provided information about Council participants' interests related to EBFM, including beliefs related to barriers and recommendations for Council transition to EBFM in the NE and MA regions.

The following sections will discuss the complex relationships between interests, access, representation, and power of the stakeholder groups that are part of the NE and MA fishery management councils that were revealed and examined during meeting observations. The connections between which stakeholders have which interests, and which constituencies' interests are represented by which stakeholders with which interests, as well as the history of interaction between representatives will lend insight into which interests dominate in each Council (Wilson, 2014).

4.2. Meeting Observations

4.2.a. Who is at the table?

The most obvious people at the fishery management council table are the voting Council members. They are either appointed or exist on the Councils due to legislative mandates. Council member seats at the table are influenced by political and potentially cultural and historical factors. About half of the voting Council members represent state government agencies related to marine resource management. The approximately other half of the voting Council members is appointed. Appointed members often represent constituencies related to the commercial fishing and processing industries, the recreational fishing lobby, charter fishing operations, and rarely, NGOs, experts from academia, and consultants.

4.2.b. Who benefits?

Some non-voting stakeholders do have access to and can influence the votes of voting

Council members at the table. Non-voting Council members do have a seat at the table, and therefore the opportunity to voice their interests, but they are not given the power to vote. Though non-voting, SSC members have a direct voice in Council decisions, since regulations require that when setting catch levels, SSC recommendations be followed. SSC members are appointed by the Council members, which allows the potential for the Council members to influence the composition of the SSC and lends a political factor to the SSC appointment process. The SSC chairman attends and reports at all MAFMC meetings. This practice is credited with improving understanding and communication about science between the SSC and the MAFMC. If the NEFMC chose to adopt this practice, understanding and communication about science may improve between NEFMC members and the SSC. The Council staff members have an indirect voice in the Council process, through the setting of agendas and the work they do on and for committees, plan development teams, working groups, oversight committees and during the preparation for fishery management plans. Members of the public may be able to provide input during Council meetings if they follow protocol to speak and if they are called on by the Council chair and if meeting time allows.

Based on meeting observations, many Council members seem to have historical ties to the commercial fishing industry, either as fishermen, seafood processors, or owners of fishing companies, and these members seem to have significant clout with the Council. Additionally, states with large fishing industries, specifically Maine, Massachusetts, and New York, have more representation on the Council, and therefore more voting power, as Council members. During Council meetings, members of the government, politics, and public from Massachusetts regularly made comments during public input sessions at meetings, asserting emotional and political pressure on voting Council members.

Scientists' input is respected to a point, but sometimes scientific uncertainty and

undermining of the science are used as excuses not to follow scientific recommendations. For example, NMFS is sometimes accused of conducting untrustworthy science or asked to redo stock assessments that determine a decrease in allowable biological catch is necessary. In one case, NMFS did make a mistake calibrating the results of its field surveys, which resulted from using the wrong fishing net, leading to incorrect calculations and therefore incorrect recommendations. Although the mistake was identified, the incident decreased NMFS scientific credibility and provided material for critics of the NMFS to reference for years into the future (Meeting Observations).

4.2.c. What for?

The study suggests that the MSFCMA and the *National Standards* included in the MSFCMA play a large role in which groups' interests are addressed in final management decisions. The *National Standards* are:

1. *Prevent overfishing while achieving optimum yield.*
2. *Be based upon the best scientific information available.*
3. *Manage individual stocks as a unit throughout their range, to the extent practicable; interrelated stocks shall be managed as a unit or in close coordination.*
4. *Not discriminate between residents of different states; any allocation of privileges must be fair and equitable.*
5. *Where practicable, promote efficiency, except that no such measure shall have economic allocation as its sole purpose.*
6. *Take into account and allow for variations among and contingencies in fisheries, fishery resources, and catches.*
7. *Minimize costs and avoid duplications, where practicable.*

8. *Take into account the importance of fishery resources to fishing communities to provide for the sustained participation of, and minimize adverse impacts to, such communities (consistent with conservation requirements).*
9. *Minimize bycatch or mortality from bycatch.*
10. *Promote safety of human life at sea*

(Commerce, 2007)

National Standard #1, with its reference to "optimum yield," supports the interests of the commercial fishing industry. *National Standard #2*, with its reference to "best scientific information available" does increase the weight the Council gives to SSC and NEFSC recommendations in its decisions. *National Standard #8*, with its reference to "fishing communities," in addition to political and constituent pressure, increases consideration of fishing community residents, especially for those communities with strong political, cultural, and historical ties to fishing, such as New Bedford, MA and Gloucester, MA. *National Standard #10*, referring to the "safety of human life at sea," does give the non-voting Coast Guard Council members some credibility and influence. The recreational fishing industry appears to have a large constituency and therefore significant political influence, but there is not much representation on the Councils for recreational fishing. However, there is some representation for the recreational fishing lobby on advisory panels. NGO representation at meetings and during opportunities for public comment is often high, and NGOs do receive some opportunities for influence through public comments, unofficial interactions with Council members, and as members of advisory panels. However, it seems that regularly NGO input, though often based on sound science, is minimized and NGO influence is often marginalized as extreme, liberal, or out of touch with the economic and social realities of the fishing industry. NGO interests are sometimes addressed through lawsuits brought against the Council and/or the government for not

meeting the requirements of the MFSCMA or other mandates and legislation.

4.3. Interview results

4.3.a. Interview Results: Barriers

Barriers mentioned in interviews were grouped into four categories of interest. These interest categories were *human dimensions* (14), *science* (6), *policy* (5), and *practice* (4). The top 3 ranked barriers to EBFM by total number of interviews in which barrier was mentioned at least once were, respectively: *Lack of science, data, and modelling capability*; *EBFM is constrained by the Magnuson-Stevens Fishery Conservation and Management Act/EBFM is not legally mandated*; and *Need socioeconomic information* (Table 2).

Council members, SSC members, and staff members from both the NE and the MA Council appeared to be generally concerned with barriers in all four categories of interest, *human dimensions*, *science*, *policy*, and *practice*. *Lack of science, data, and modelling capability* was identified as a barrier by the highest number of interviewees (Table 2). The Council members, staff members, and SSC members of each region were concerned that the science of EBFM is not sufficient, the models to calculate fisheries removals under EBFM are not adequate, and/or that enough data have been collected to run EBFM models that would create output adequate to conduct EBFM. However, some of the scientists interviewed did believe that the science, models, and data for EBFM are sufficient to practice, or at least begin implementation of EBFM. The recurrence of the concern among interviewees that there is a lack of available scientific data required for EBFM, "The science right now needs to improve for us to move into Ecosystem Management," (Staff member) contrasted with the feedback from scientists that there is enough good scientific data and models for EBFM to progress, "I don't think the science is going to hold it back," (SSC member) highlights the question of whether *Lack of science* as a barrier is a self-perpetuated and unrealistic concern within the Councils. If so, perhaps increased

communication between scientists from the Northeast Fisheries Science Center (NEFSC) and the SSCs and Council members is needed. Alternatively, another perspective sometimes voiced by Council stakeholders was that the perception that there is a *Lack of data* or a *Lack of science* is used as stalling strategy to delay the transition to EBFM, "The science body will sometimes be used as a delaying tactic or um some way to trying to get the second bite at the apple" (SSC member).

For all interviewee categories, *EBFM is constrained by the Magnuson-Stevens Fishery Conservation and Management Act/EBFM is not legally mandated* was a commonly cited barrier (Table 2). Interviewees commonly expressed concern that EBFM is not allowable under the current version of the MSFCMA, particularly *National Standard #1*, *Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry*, which requires that all managed stocks be rebuilt to meet optimum yield for each fishery (Magnuson, 2007). Council members, managers, and staff members were concerned that EBFM would contradict SSFM, which is practiced with the objective of catching the optimum yield required by *National Standard #1*. Additionally, these interviewees believed that the Councils do not have the regulatory power to implement EBFM and that there is lack of Congressional support for EBFM, "So we cannot, you know the Magnuson Act says that we manage species to a certain level and can't deviate from that so unless the law changes that's where we're at" (Council member). However, other interviewees believed that EBFM is supported under the MSFCMA, "…Magnuson sort of requires you to do ecosystem-based type things," (Staff member), specifically by *National Standard #9*, *Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch* (Commerce, 2007), which seeks to minimize bycatch, and

National Standard #8, which promotes engagement of communities *Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of paragraph (2), in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities* (Commerce, 2007).

The MSFCMA was due for reauthorization in 2013 but reauthorization has not yet been completed. Many interviewees believed the reauthorization will be pivotal to the future of EBFM. Under the current version of the MSFCMA many interviewees perceived that the Councils are under threat of litigation if they practice EBFM; however, if the reauthorization contains language that more specifically mandates EBFM, these interviewees believed that Councils will experience more legal pressure and less legal uncertainty toward transitioning to EBFM. A number of interviewees believed that if the MSFCMA were modified to decrease the weight of *National Standard #1*, which requires all stocks to be rebuilt to sustainable levels and included language to explicitly allow EBFM, the implementation of EBFM by the Councils would proceed much more quickly than it is under the current version of the MSFCMA. However, many stakeholders perceived that it is legislatively defendable to conduct EBFM under the current MSFCMA.

The barrier *Need for socioeconomic information* was mentioned by many interviewees in each of the interviewee groups (Table 2). A large percentage of interviewees had the impression that the amount of socioeconomic information required to make holistic management decisions and mandated under *National Standard #4* (Meeting Observations) was not available: *Conservation and management measures shall not discriminate between residents of different*

States…" and *National Standard #8, Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that meet the requirements of paragraph (2), in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities*. Some interviewees would prefer more certainty for the effects of EBFM on regulations, economics, and jobs. Many interviewees would prefer more surveys and more inclusion of stakeholder input before Council decisions are made. Additional details about stakeholder perceptions of social science needs for EBFM are included in Chapter 5 (Biedron, 2014b).

The barrier *Lack of goals and an implementation plan for* EBFM, was a commonly cited barrier. Interviewees voiced their frustration for the lack of universal goals and/or an implementation plan for EBFM. People had different reasons for supporting EBFM and there were different interpretations of how it will serve their needs. One interviewee believed that one positive aspect of EBFM is, "So I think it can simplify things and get things done quicker if we're looking at space rather than looking at individual species" (Staff member). Other reasons given to support EBFM were "I would like to really get into that so that we can manage in a way that is more sensitive to these ecological relationships" (Council member), "You have to look at it more holistically" (Council member), and "I think we need, I see us needing to move forward in a way that we have a better understanding of the implications and the interactions between the fish species that we are charged to manage as well as the species that we are not charged to manage" (Council member).

Many interviewees mentioned that defining specific goals and/or a specific implementation plan would make the practice of EBFM much more feasible, "More tangible

plans" (Council member). The NEFMC requested that its SSC create a white paper to describe a transition plan to EBFM, which the SSC did. However, in the last few years, due in part to NEFMC prioritization to respond to Groundfish management crises, the pursuit of EBFM by the NEFMC slowed considerably. However, recently, the NEFMC has refocused its attention to EBFM, with tangible evidence being two Ecosystem-based Management Committee meetings held to date in 2014. The MAFMC is performing an Ecosystem Approach to Fisheries Management, which is a bottom up approach to Ecosystem Management rather than the top down approach that some interviewees associate with EBFM.

Lack of universally accepted definition of EBFM was a commonly cited barrier. One concern of interviewees is that people may have differing opinions about how EBFM is defined. For example, one respondent explained her understanding of EBFM this way, "I have always thought of it in terms of if we can move in a direction that takes into account a broader range of ecological factors that cause abundance of species and health of species in general" (Council member). Another defined EBFM this way: "It's fisheries management taken into a broader context for the targeted species, not only looking at the dynamics of the fish itself, but how those dynamics are influenced by its environment…" (SSC member). The reason this could be a problem is that while many stakeholders support EBFM in theory, once the specifics of an EBFM plan are outlined, there may be more disagreement about the implementation of EBFM. These disagreements may occur because groups with differing interests and varying levels of power become more polarized as specific regulations and/or actions are developed (Wilson, Personal Communication, 2014). For example, some interviewees believed that EBFM could allow the overexploitation of some stocks, such as dogfish, which is not currently allowed under *National Standard #1*. However, other interviewees worry that the removal of the regulations for the rebuilding of single stocks could endanger the health of species and put some stocks in

danger of depletion.

The barrier *Lack of stakeholder by-in* was a popularly cited potential barrier to EBFM. There was concern from some interviewees that if stakeholders did not perceive a benefit to EBFM then there would not be an incentive to support it. For stakeholders to learn about how EBFM would affect the specifics of fisheries regulation, the NEFMC, the MAFMC and the NEFSC would need to do more educational outreach about EBFM.

4.3.b. Recommendations

Recommendations mentioned in interviews were grouped into four categories of interest. These interest categories were *practice* (5), *human dimensions* (4), *science* (2), and *policy* (3). Overall, the top 3 ranked recommendations by total number of interviews in which recommendation was mentioned at least once, all for the interest *practice*, were respectively: *Define EBFM, identify objectives, and determine specific plan and time line for implementation*; *Transition to EBFM incrementally*; and *Implement EBFM on an experimental or pilot study scale, observe outcomes, and adapt management as necessary*.

The recommendation *Define EBFM, identify objectives, and determine specific plan and time line for implementation* was cited by the highest number of interviewees, which expressed a desire for more specifics regarding EBFM. There was general concern that EBFM is too vague and could be interpreted in a variety of ways depending on the interests of the user group. Interviewees suggested a variety of objectives or plans for implementation of EBFM, including developing terms of reference for the SSC regarding EBFM and creating Council subcommittees, plan development teams, and advisory panels for EBFM. Several specific recommendations under this category included: "I like to use the word 'smarts' – having outcomes that are specific, measurable, achievable, relevant in time now" (Council member); drafting an EBFM plan; imagining, ideally, how to do EBFM and then building the management

system from scratch; and "You know this is basically poker for fish right and what's the trump cards and no one has put all that on a table and laid out the rules of the card game if you will" (SSC member).

The recommendation *Transition to EBFM incrementally* reflected the high level of support for an incremental transition to EBFM by interviewees. This support of an incremental transition to EBFM was also expressed by the commercial and recreational fishermen, non-governmental organization leaders, Council members, and SSC members who completed the survey sent to stakeholders in the MA and NE regions in 2013 (Biedron, 2014a, 2014b).

The recommendation *Implement EBFM on an experimental or pilot study scale, observe outcomes, and adapt management as necessary* highlights a common response heard during the study, which is that in order for the Council to implement EBFM on a regional scale, it would be helpful to first try EBFM on a smaller scale or experimental basis, and then adapt or modify the EBFM plan as needed to correct for unanticipated problems and to improve the plan based on observations of the plan in practice.

The recommendation *Practice EBFM based on spatial management (ecosystem production units)* was supported by a higher number of NE interviewees than MA interviewees. The practice of EBFM using ecosystem production units was a preferred approach for the NEFMC, whose SSC suggested it use a spatial approach to EBFM. As noted previously, the MAFMC is using an Ecosystem Approach to Fisheries Management, which is an incremental approach that incorporates ecosystem factors into fisheries management plans (MAFMC, 2014b). The recommendation *Consider removals based on a biomass cap* was also suggested by more NE interviewees than MA interviewees. A number of interviewees suggested that EBFM be based on biomass removals, which would regulate by total tonnage of all stocks combined for each permit instead of tonnage in an individual stock basis. This means that all bycatch would

be included in the count towards overall catch.

The recommendation *Evaluate tradeoffs of EBFM plans* reflects the perspectives of interviewees who believe that the success of EBFM will depend on comparing tradeoffs within the ecosystem between species which are fished more and less heavily. These interviewees placed a strong emphasis on the management system having the ability to assess both the scientific and socioeconomic benefits and costs of EBFM.

Interests: Barriers and Recommendations for EBFM

Below, the interview results that relate to potential barriers to and recommendations for the practice of EBFM are discussed. For each category of interest (*science*, *human dimensions*, *policy*, and *practice*), which are the same for barriers and for recommendations, the relationship between *access*, *representation*, and *power* and NE and MA stakeholder groups will be discussed.

4.4. Interests

4.4.a. Interest #1: Science

In terms of the interest *science*, SSC members, as well as required reports, including Stock Assessment Workshop (SAW) and Stock Assessment Review Committee (SARC) reports from the NEFSC, have the most influence on Council decisions, due to their scientific credibility and the mandate by the 2006 Magnuson reauthorization to adhere to their recommendations when setting catch levels for fishery management plans. Additionally, due to their expertise, scientific input from Council Staff members is respected and considered in discussions where fishery management plan alternatives are discussed. Representation by the other stakeholder groups, including MA and NE commercial fishermen, recreational anglers, and NGOs, receive much less attention by Council members when considering barriers related to *science*.

Some members of the SSC have ideas for research that could be useful to the Councils,

but some frustration was expressed by SSC members that although the Councils may be open to this research if it were proposed, the Council members were not aware of the need and therefore may not request that the studies to be completed by the SSC. This communication weakness may suggest that the Councils create a process by which they solicit ideas about potential research from the SSC for consideration by the Council.

It appears that having a doctorate degree (almost all members of both the NEFMC and MAFMC SSCs have doctorates) (MAFMC, 2014a) and/or extensive management experience, such as working as a Council staff member and/or for the NEFSC for a number of years, increase leverage in Council decisions. However, affiliation also seems to play a role in power. For example, scientists with doctorates on the SSC and working at the NEFSC seem to have more direct influence on Council votes than scientists with doctorates working for NGOs.

4.4.b. Interest #2: Human dimensions

It seems that there is not clear access or representation for interests related to *human dimensions*. A handful of SSC members are experts in human dimensions and/or social science and can provide their input via SSC recommendations. There is a Social Sciences Branch at the NEFSC, but it seems that direct communication with the Social Sciences Branch is lacking.

Additional human dimensions input comes from social scientists or economists on Council-affiliated committees, plan development teams, and advisory panels, or from experts asked to present data at meetings. Council staff members often include information about human dimensions in reports and materials given to Council members but this information may be lost in the large amount of information given to Council members to review. Based on interviews, it seemed that there are no or very few Council members with expertise in human dimensions.

Power to influence Council decisions about human dimensions may increase if reports or studies with specific numbers about jobs or income that were or would be lost due to a specific

fishery management plan were available, but such studies seem scarce and some social scientists interviewed suggested that the data required for these studies is unavailable. Additionally, Council members and staff have the power to increase consideration of human dimensions in EBFM by prioritizing it. For example, for the 2011 "Fourth National Meeting of the Regional Fishery Management Council's Scientific and Statistical Committees," "Social Science Consideration" was one of two topics covered during the meeting, which provided the opportunity for experts from around the world to discuss social science considerations for the council, alongside ecosystem considerations, giving human dimensions more visibility, and therefore more influence, in the Council process (MAFMC, 2012a).

4.4.c. Interest #3: Policy

The groups that have most access to policy seem to be the Northeast Regional Administrator and Assistant Regional Administrator for NOAA/NMFS, the NOAA General Counsel for each council, and the Council staff. Most stakeholder groups seem to rely on Magnuson to organize policy and formulate decisions. Access seems limited to those with a connection to regulatory bodies with decision-making power, such as the Regional Administrator who seems to answer to NOAA Fisheries and the Secretary of Commerce regarding management decisions. Power regarding policy seems to be almost completely reliant on the MSFCMA and how the *National Standards* of the MSFCMA are interpreted by the Northeast Regional Administrator, NOAA Fisheries management, or in the case of any lawsuits brought against the Council or NOAA Fisheries, on how the courts interpret the MSFCMA. Ultimately, the laws, regulations, and mandates pertaining to marine federal fisheries appear to be the driving factors behind decisions made by the NEFMC and the MAFMC.

4.4.d. Interest #4: Practice

Access seems most related to the interest *practice*. Commercial and recreational

fishermen, as well as the NGO groups that closely follow fishing practice and management, perhaps have the most current and relevant experience with the implications of fisheries management, of all the stakeholder groups. While Council members, staff, and SSC members design fishery management plans, it is the commercial and recreational fishermen who practice them. Therefore, it seems that public input from commercial and recreational fishing stakeholder groups is most accepted and therefore best represented when discussing interests related to *practice*. Furthermore, power, or ability, of commercial and recreational fishing stakeholder groups to influence Council decisions regarding *practice* is sizeable because these stakeholders have credibility based on lifetimes of fishing experience as well as political support from politicians who represent constituents that are fishermen. Additionally, as a percentage of appointed Council members, it seems that commercial fishermen are well-represented on both Councils, which increases the chances that their needs will be voiced and advocated for by the Council process.

4.5. Conclusion

The meeting observations and interviews conducted for this study improved understanding of perceived barriers to and recommendations for EBFM about Council participants, specifically related to the social dimensions that demonstrate *Planning Table* components of access, representation, power, and interests. Meeting observations helped inform answers about how access to Council affects management outcomes. The interviews provided information about the interests of the interviewees related to the transition to EBFM. Overall the study demonstrated that social dimensions are an important consideration for Council transition to EBFM, both pertaining to overcoming barriers to EBFM and to recommendations for the development of transition plans to EBFM.

Throughout all the meeting observations and interviews, and consistently across

managers and stakeholders in both the NE and MA regions, there was general consensus that EBFM is a holistic approach to fisheries management which includes biological, environmental, and human factors, and that the Councils should gradually transition to a management plan that reflects EBFM. Once the specifics of EBFM time lines, science, and quotas are discussed, opinions diverge, but overall there is agreement between Council decision makers and stakeholders in the NE and MA regions about what EBFM is and if it should be done.

Although the concerns from members of the fishing community, whose histories, cultures, well-being, residents, recreation, and income rely on commercial and recreational fishing do represent real and human difficulties and must be considered in management decisions, for some fisheries, the science demonstrates that there are simply not enough fish to support commercial and recreational fishing industries while also maintaining the health of the stocks for next year and the years beyond that. The scientific facts, often presented by the SSC and the NEFSC as the acceptable biological catch (Commerce, 2007), are nonnegotiable. Therefore, the brightest hope for building healthy fish populations and marine ecosystems which support sustainable fishing communities and industries tomorrow is to manage fishing responsibly, based on the best available science and a precautionary approach, today.

Note: Perspectives of government officials are personal views and do not necessarily represent the views of the United States' government.

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CHAPTER 4

DEFINITIONS, PRACTICES, AND OUTCOMES OF ECOSYSTEM-BASED FISHERIES MANAGEMENT FOR THE NEW ENGLAND AND MID-ATLANTIC FISHERY MANAGEMENT COUNCILS

ABSTRACT

Ecosystem-based fisheries management (EBFM) has been emerging as a promising alternative to single species fisheries management (SSFM) in the New England (NE) and Mid-Atlantic (MA) regions of the United States as increasing numbers of policymakers, scientists, and managers acknowledge that the SSFM approach practiced under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (Commerce, 2007) is not sufficient to meet fisheries management objectives (Botsford, Castilla, & Peterson, 1997; Francis, Hixon, Clarke, Murawski, & Ralston, 2007; Iles, 1980; Levin, Fogarty, Murawski, & Fluharty, 2009; Pikitch et al., 2004; Sette, 1943). The purpose of our study was to improve understanding of factors contributing to or preventing progress toward EBFM implementation in the Mid-Atlantic Fishery Management Council (MAFMC) and New England Fishery Management Council (NEFMC), focusing on Council member and stakeholder beliefs, attitudes, and mutual understanding. We analyzed a total of over 1,000 survey responses about EBFM from commercial fishermen, recreational anglers, non-governmental organization (NGO) leaders, Scientific and Statistical Committee (SSC) members and MAFMC and NEFMC members in the NE and MA regions. To frame our study, we used the *Coorientation Model* (Connelly & Knuth, 2002; Leong, McComas, & Decker, 2008; J. M. McLeod & Chaffee, 1973) to characterize understanding between the Council and fisheries-related stakeholder groups. Lack of agreement or understanding between

Council members and stakeholders does not appear to be a barrier to MA or NE Council transition from SSFM to EBFM. Since it appears that, at least for the MA and NE regions, most stakeholders agree on definitions, practices, and outcomes for EBFM, the challenge to transitioning to EBFM will be to address other perceived barriers to EBFM. The study suggests that most Council members and stakeholders in the MA and NE regions want a change from SSFM to EBFM at an incremental, intermediate, or complete, gradual (5-10 years) pace. Making the transition from SSFM to EBFM, at least in the initial stages, may require more coordination between Council members and stakeholders than current management requires, and therefore, understanding between stakeholders will be increasingly important to maximize collaboration and minimize conflicts (Connelly & Knuth, 2002; Freemuth, 1996; Sample, 1994).

Keywords: ecosystem-based fisheries management, Coorientation, New England Fishery Management Council, Mid-Atlantic Fishery Management Council

1. Introduction

Ecosystem-based fisheries management (EBFM) has been emerging as a promising alternative to single species fisheries management (SSFM) in the New England (NE) and Mid-Atlantic (MA) regions of the United States as increasing numbers of policymakers, scientists, and managers acknowledge that the SSFM approach practiced under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (Commerce, 2007) is not sufficient to meet fisheries management objectives (Botsford et al., 1997; Francis et al., 2007; Iles, 1980; Levin et al., 2009; Pikitch et al., 2004; Sette, 1943). The MSFCMA (Commerce, 2007) is the guiding piece of legislation regarding the federal United States (U.S.) exclusive economic zone. EBFM, a component of the broader concept of ecosystem-based management (EBM), a holistic

approach to wildlife and fisheries management (K. L. McLeod & Leslie, 2009), is a management approach that interests many stakeholders, including fisheries managers and fishermen. EBFM is defined as the process of "managing fisheries to coordinate, account for, and include all factors in a holistic, synthetic, integrated fashion"(Link, 2010). A distinguishing feature of EBFM is that it is based on a multi-species approach, which is a significant change from the SSFM approach currently practiced under the MSFCMA. Several key reports, including the U.S. Commission on Ocean Policy's *An Ocean Blueprint for the 21st Century* (USCOP, 2004) and the PEW Ocean Commission's *America's Living Oceans: Charting a Course for Sea Change* report (POC, 2003), in addition to President Obama's *National Ocean Policy* (CEQ, 2010) have encouraged using EBM as a guiding approach to ocean management, including fisheries management. Historically, there has been an institutional precedent to practice SSFM under the MSFCMA, but the MSFCMA is currently undergoing reauthorization, which may result in changes that would more explicitly mandate the use of EBFM.

When the U.S. Congress enacted the Fishery Conservation and Management Act in 1976 (the precursor to the MSFCMA) (Commerce, 2007), it designated the creation of eight regional fishery management councils within the U.S. Within their respective regions, the FCMA/MSFCMA granted councils the authority to identify which fisheries need management and to develop fisheries management plans, amendments, and suggested regulations to manage the selected fisheries (K. L. McLeod & Leslie, 2009). The South Atlantic, Gulf of Mexico, Mid-Atlantic, New England, Western Pacific, North Pacific, and Pacific regional fishery management councils are currently carrying out some level of EBFM planning or implementation (Dereynier, 2012). The Caribbean Fishery Management Council is presently working to transition from SSFM to island-based fishery management plans (CFMC; Member, 2014). Many previous efforts to transition from SSFM to EBFM have been slow, bureaucratically laborious, or

nonexistent (Francis et al., 2007), but over the last several years, both the New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC) have moved toward creating plans to implement EBFM. The MAFMC, in response to the feedback it received during its *Visioning Project* (MAFMC, 2012b, 2014a), is moving forward to develop a plan to implement an Ecosystem Approach to Fisheries Management (EAFM) Guidance Document (MAFMC, 2012a). During 2013, the NEFMC suspended progress toward its 2008 decision to develop a plan for and to implement EBFM. In 2014, the NEFMC voted to include EBFM on its 2014 priority list as a multi-year task, and the Council has held two Ecosystem-Based Management Committee meetings to date in 2014.

The purpose of our study was to improve understanding of factors contributing to or preventing progress on EBFM implementation in the MAFMC and NEFMC, focusing on Council member and stakeholder beliefs, attitudes, and mutual understanding. For our study, the term "stakeholders" refers to commercial fishermen, recreational anglers, non-governmental organization (NGO) leaders, and Scientific and Statistical Committee (SSC) members. We sent surveys to more than 5,600 commercial fishermen, recreational anglers, NGO leaders, SSC members and MAFMC and NEFMC members in the NE and MA regions about EBFM and received over 1,000 responses. We explored the extent to which Council members and stakeholders agreed about EBFM topics, how well the Council members predicted stakeholder responses, and how similar Council member predictions for stakeholders were to their own responses.

To frame our study, we used the *Coorientation Model* (Connelly & Knuth, 2002; Leong et al., 2008; J. M. McLeod & Chaffee, 1973) to characterize understanding between the Council and fisheries-related stakeholder groups. In order for Council members to be able to represent and consider their constituents' views in decision-making processes, there must be some degree

of effective communication and mutual understanding between Council members and stakeholders. Lack of understanding between stakeholder perspectives could influence execution of goals (Scarnecchia, 1988). Using the *Coorientation Model* could help fishery management councils understand more fully what barriers stakeholders perceive in the transition from SSFM to EBFM. Making the transition from SSFM to EBFM, at least in the initial stages, may require more coordination between Council members and stakeholders than current management requires, and therefore, understanding between stakeholders will be increasingly important to maximize collaboration and minimize conflicts (Connelly & Knuth, 2002; Freemuth, 1996; Sample, 1994). Analysis of the quality of understanding between members of the Councils and stakeholder groups allowed for comparisons of beliefs about EBFM and measurements of the extent of understanding between these groups.

The survey methods in this study employed the Coorientation approach used by Leong et al. (2008) to study aspects of communication between managers and stakeholders. Based on mail survey data, we used the *Coorientation Model* to measure the quality, including the agreement, accuracy, and congruency, of communication between the Council members and stakeholders. We defined *Agreement* as "the extent to which the Council members and stakeholders hold the same attitudes and beliefs;" *Accuracy* as "the extent to which Council members' predictions of stakeholder attitudes and beliefs is similar to the stakeholders' actual attitudes and beliefs:" and *Congruency* as "the extent to which the Council members' predictions of stakeholder attitudes and beliefs is similar to their own"(Leong et al., 2008). Coorientation measures allowed us to characterize the similarity of Council member and stakeholder attitudes about EBFM, how accurate Council members are in predicting stakeholder attitudes about EBFM, and how Council member predictions for stakeholders compare to their own responses. *Agreement* was measured between Council members and each stakeholder group for the NE and

MA regions. *Accuracy* was measured for Council members in relation to each stakeholder group for the NE and MA regions. *Congruency* was measured for Council member predictions for each stakeholder group for the NE and MA regions in relation to their own perspectives (See Figure 1, Chapter 1). *Accuracy* and *Congruency* were measured for only the Council members' estimates of each of the stakeholder groups' perspectives, and not vice versa, because the Council members directly vote on policy decisions about EBFM. From the perspective of Council members and stakeholders, we asked specifically: *What concepts should be included in the definition of EBFM? What are the practices that should be implemented as part of fisheries management in the Mid-Atlantic/New England region over the next 10 years?* and *What are the desired outcomes for fisheries management in the Mid-Atlantic/New England region over the next 10 years?* Specifically, the objective of our study was to improve understanding of Council member and stakeholder beliefs, attitudes, and mutual understanding about the definition, practice, and desired outcomes for implementation of EBFM in the NE and MA regions.

Understanding how Council members and stakeholders perceive EBFM and how well members understand the perceptions of other stakeholders may contribute to efforts to foster adoption of EBFM as an approach for managing marine fisheries.

2. Methods

2.1. Mail survey methodology

We used a mail survey to study perceptions about EBFM between Council members, SSC members, and fisheries-related groups (commercial fishermen, recreational anglers, and NGO leaders) in the NE and MA regions, and to characterize understanding between Council members and stakeholders based on the *Coorientation Model*. We measured *Agreement*, *Accuracy*, and *Congruency* (Connelly & Knuth, 2002; Leong et al., 2008) and compared beliefs and attitudes about EBFM among Council members compared to SSC members and

stakeholders. We developed two versions of the mail survey. The "decision maker" survey was sent to Council members and SSC members from the NE and MA regions. The "stakeholder" survey was sent to commercial fishermen, recreational fishermen, and NGO leaders working on fisheries policy in the NE and MA regions. From January 16, 2013 until March 1, 2013, we sent up to four mailings to selected NE and MA survey recipients to encourage participation (Dillman, 1978).

We calculated the "required sample size for accuracy level of +/- 5% for various population sizes (N=Inf.) and Confidence Levels (% of Population with Given Characteristic = 50%)," (Kish, 1965) for each stakeholder group. We distributed a total of 5,651 surveys in the NE and MA regions to selected individuals, including all NEFMC and MAFMC members and SSC members, to leaders of NGOs with interests in federal fisheries in the NE and MA regions, and to individuals randomly selected from the Councils' lists of contacts for commercial fishermen and recreational anglers and from lists of commercial and recreational fishing permit holders in NE and the MA. Some individuals are members of both the NEFMC and the MAMFC. Due to their central positions on the councils, each of these dual-council participants was invited to respond to both surveys. Full versions of the NE and MA decision maker and stakeholder surveys are included in Appendices H, I, J, and K. Our study protocol was reviewed by the Cornell University Institutional Review Board and deemed exempt (Appendix E).

2.2. Identification of survey recipients

We compiled NEFMC and MAFMC member and SSC member contact information from the NEFMC (NEFMC, 2014) and MAFMC (MAFMC, 2014b) websites. We created the list of commercial fishermen and recreational anglers by randomly selecting a subsample of individual names from the list of permit holders for each group from both the NE and MA regions. We included only commercial fishermen and recreational anglers whose interests were related to

federally-regulated fisheries within either the region regulated by the NEFMC or the MAFMC. We consulted a publicly accessible government-supported database (NERO, 2012) to identify the sample of survey recipients from the commercial fishing industry in the NE and MA regions. We compiled the contact information of individuals listed as holders of NOAA Fisheries Northeast Region Vessel Operator cards (permits) on the National Oceanic and Atmospheric Administration's website (as of 7/9/12) (NERO, 2012). The Northeast region includes both the NE and MA Council areas. We identified permit holders as from the MA or NE Council area based on whether the affiliated address was within the NE (Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut) or MA (New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina) region. We removed individuals with addresses outside of the NE or MA regions. We created separate lists for current operators for the NE and the MA regions, and each list was sorted by alphabetical order by last name and then first name. It is possible that survey recipients selected from the "operators" list may not actually have been commercial fishermen or operating their vessels at the time of survey distribution.

Marine recreational permitting lists are controlled by state governments, which release permitting information on a case-by-case basis. Only Virginia, Pennsylvania, Connecticut, and Massachusetts agreed to make their recreational permitting lists available for our study; recreational angler survey responses therefore represent only recreational permit holders from those states. We randomly sampled marine recreational fishermen from each of the 2011-2012 state registries of registered marine recreational anglers from Pennsylvania, Virginia, Massachusetts, and Connecticut. These lists contained residents and non-residents seeking a marine recreational fishing license for the respective state. We removed registrants under the age of eighteen from data sets before sampling. The names in each state's database were listed in alphabetical order by last name, then first name. The spreadsheets for Pennsylvania and Virginia

contained data from combined years (2011-2012) and Massachusetts and Connecticut had separate sheets for 2011 and 2012, which were combined before sampling. We selected samples for each of the four states from the combined 2011 and 2012 data for each state. We reviewed selected recipients to confirm that the same name was not sampled twice.

We used several techniques to compile the NGO leader stakeholder list for marine fisheries organizations in the NE and MA regions. We conducted an internet search for the phrases "nongovernmental organizations in New England fisheries" and "nongovernmental organizations in Mid-Atlantic fisheries." Although the search focused on environmental non-governmental organizations related to marine fisheries in the NE and MA regions, it also included other organizations related to marine fisheries in the NE and MA regions. Once an organization was identified that met the search criteria, the contact information for either the leader of the organization, or the person who was most directly related to marine fisheries for the organization, was included in the sample. Additionally, we reviewed sign-in sheets and observation notes from NEFMC and MAFMC full meetings from 2011 and 2012 and included the representatives of those marine fisheries-related organizations listed in the survey sample. We also used contact lists provided by the Council staff members to identify leaders of marine fisheries organizations in the NE and MA regions. Because the final list of NGO contacts was relatively short, we sent surveys to all NGO contacts that had been identified through the various identification processes.

2.3. Non-respondent phone follow-up

We conducted non-respondent phone follow-up data collection, consisting of a shortened version of the mail survey conducted by telephone, from March 28, 2013 through April 16, 2013, with 200 survey non-respondents (50 NE commercial fishermen, 50 NE recreational anglers, 50 MA commercial fishermen, and 50 MA recreational anglers) (Loker, Decker, & Schwager, 1999;

Tarrant, Manfredo, Bayley, & Hess, 1993). We did not include Council members and NGO leaders in the non-respondent phone follow-up because these group sizes were small initially.

The Survey Research Institute at Cornell University (SRI) conducted the non-respondent telephone survey follow-up. We provided SRI with a sample of 4,040 non-respondent fisheries stakeholders representing the four strata (two fishing regions and two types of permits). SRI randomly selected a total of 1,411 stakeholders from across all four strata combined for the follow-ups. SRI attempted Lexis-Nexis lookups (using names and addresses) for the 1,032 of the 1,411 randomly sampled stakeholders whose records did not include a phone number. Overall, from the 1,411 randomly selected stakeholders, by combining the stakeholders whose records initially included phone numbers and those stakeholders whose phone numbers were found using Lexis-Nexis, SRI's final working sample of non-respondents to contact by phone was 1,033. SRI completed a total of 200 phone interviews, with 50 interviews in each of the four strata.

2.4. Chi-square test for association

To analyze the results from the non-respondent phone follow-ups, we used a *Chi-square test for association* (*Pearson Chi-Square* was used since neither variable was dichotomous) in SPSS ("IBM SPSS Statistics for Windows, Version 21.0," 2012) to compare the survey responses between the initial survey response group and the non-response group to determine if survey group was statistically independent of survey response at the $P < 0.05$ level.

2.5. Survey data analyses

We entered the data from the returned questionnaires into a computerized data file and used SPSS ("IBM SPSS Statistics for Windows, Version 21.0," 2012) for analysis. We used a *Two-Way ANOVA* and a post-hoc *Tukey* test, assuming equal variances, to analyze the data and calculate agreement, accuracy, and congruency between decision makers and stakeholders.

To calculate *Agreement Level* between Council members and one of the relevant stakeholder groups from the appropriate region, we calculated the mean survey responses for each stakeholder group to each question. All survey responses were measured on a Likert scale of 1-5 (6's, "Don't Know" responses were removed from the data set for analysis). We then calculated the absolute value of the difference in mean response between the two groups. The maximum possible difference in mean response was 4, which would represent the lowest possible agreement. The minimum difference in mean response was 0, which would be complete agreement. To represent *Agreement Level* as directly correlated to agreement, *Agreement Level* was calculated by subtracting the absolute value of the mean response difference from 4. Therefore, 4 = Highest *Agreement Level* and 0 = Lowest *Agreement Level* where *AGREEMENT LEVEL = {4 - (Absolute value of mean response difference)}*.

To calculate *Accuracy Level* between Council members and one of the relevant stakeholder groups from the appropriate region, we calculated the mean survey responses for each stakeholder group to each question as well as Council member mean predictions of each stakeholder group's responses to each question. We then calculated the absolute value of the difference in the mean prediction of Council members for the stakeholder group in question and the mean response of the stakeholder group. The maximum possible difference in mean response was 4, which would represent the lowest possible accuracy. The minimum difference in mean response was 0, which would be complete accuracy. To represent *Accuracy Level* as directly correlated to accuracy, *Accuracy Level* was calculated by subtracting the absolute value of the mean response difference from 4. Therefore, 4 = Highest *Accuracy Level* and 0 = Lowest *Accuracy Level* where *ACCURACY LEVEL = {4 - (Absolute value of mean response difference)}*.

To calculate *Congruency Level* between Council members and each of the relevant

stakeholder groups from the appropriate region, we calculated the mean survey responses of Council members to each question as well as Council member mean predictions of each stakeholder group's responses to each question. We then calculated the absolute value of the difference in the mean prediction of Council members and the mean response predicted for the stakeholder group in question. The maximum possible difference in mean response was 4, which would represent the lowest possible congruency. The minimum difference in mean response was 0, which would be complete congruency. To represent *Congruency Level* as directly correlated to congruency, *Congruency Level* was calculated by subtracting the absolute value of the mean response difference from 4. Therefore, 4 = Highest *Congruency Level* and 0 = Lowest *Congruency Level* where *CONGRUENCY LEVEL = {4 - (Absolute value of mean response difference)}*.

3. Results and Discussion

3.1. Survey response rate and non-respondent bias

The overall survey response was 1,083 returns out of 5,651 surveys mailed; the response rate varied by group from 57% to 14% (Table 4). Only recreational anglers from the states of Virginia, Pennsylvania, Connecticut, and Massachusetts allowed us access to their recreational permitting lists and were therefore included in the survey. As a result, some response biases may have occurred since a large number of states' recreational anglers were not represented in the survey. It seems reasonable that in New England, Maine's recreational anglers may have responded to the survey differently than the survey respondents from Massachusetts and Connecticut since Maine is a large state at the northern edge of New England, which could have a different array of stocks than Massachusetts and Connecticut, which are farther south. In the Mid-Atlantic, stakeholders from New York, New Jersey, Delaware, Maryland, and North Carolina are all likely to be different from the survey responses of Pennsylvania, which has only

a small sliver of access to marine waters, and Virginia, which may not have as vibrant a fishing industry as other areas. Although response rates are relatively low for commercial and recreational fisheries stakeholder groups in each region, we found no evidence of non-response bias.

3.2. Chi-square test for association to assess non-response bias

To analyze the results from the non-respondent phone follow-ups, we used a *Chi-square test for association* (*Pearson Chi-Square* was used since neither variable was dichotomous) in SPSS (IBM SPSS Statistics 21) to compare the survey responses between the initial survey response group and the non-response group to determine if survey group was statistically independent of survey response at the $P < 0.05$ level.

For the *Chi-square test for association* between survey set and familiarity with EBFM, all expected cell frequencies were greater than 5. There was a statistically significant (χ^2 (3) = 19.659, p = .000), but low association ($\varphi = 0.133$, p = .000) between survey set and familiarity with EBFM. *Cramer's V* was used since neither variable is dichotomous.

For the *Chi-square test for association* between survey set and familiarity with *"New England Fishery Management Council"* or *"Mid-Atlantic Fishery Management Council,"* all expected cell frequencies were greater than 5. There was a statistically significant (χ^2 (3) = 12.771, p = .005), but low association ($\varphi = 0.107$, p = .005) between survey set and familiarity with the term *"New England Fishery Management Council"* or *"Mid-Atlantic Fishery Management Council"*. *Cramer's V* was used since neither variable is dichotomous.

Based on these analyses, no corrections were made to the data to adjust for non-response bias.

Table 4. Survey response rates to decision maker and stakeholder surveys distributed to recipients in the NE and MA regions.

SURVEY RECIPIENT GROUP	# RETURNS	# SENT	% RESPONSE RATE
Members of both Councils	10	10	100%
New England Council decision makers	27	59	46%
Mid-Atlantic Council decision makers	35	61	57%
New England NGO Leaders	39	78	50%
Mid-Atlantic NGO Leaders	16	56	29%
New England Commercial Fishermen	238	1333	18%
Mid-Atlantic Commercial Fishermen	279	1333	21%
New England Recreational Anglers	190	1333	14%
Mid-Atlantic Recreational Anglers	232	1333	17%

3.3. Survey responses: Agreement Levels and Accuracy Levels

Agreement Levels and *Accuracy Levels* for responses to the survey questions about definitions, practices, and outcomes for EBFM are described below (Figures 2a-2f).

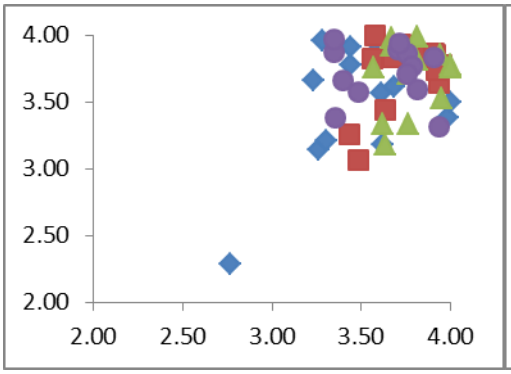


Figure 2a.

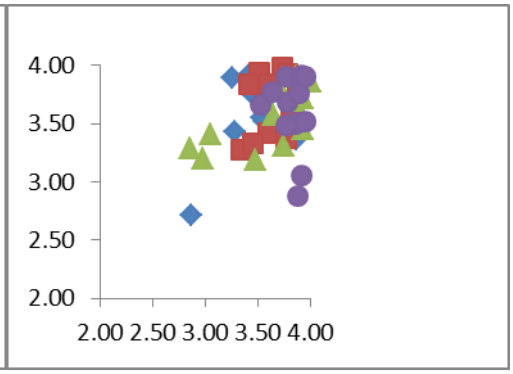


Figure 2b.

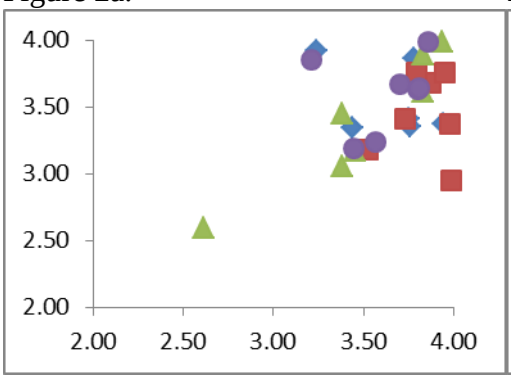


Figure 2c.

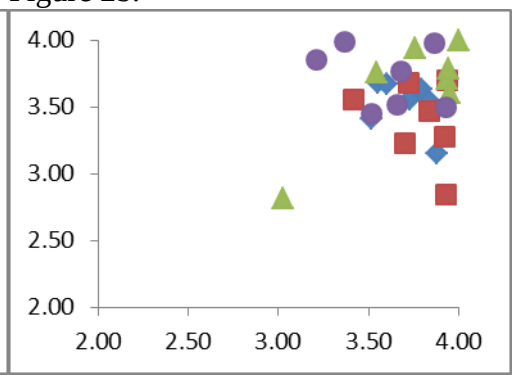


Figure 2d.

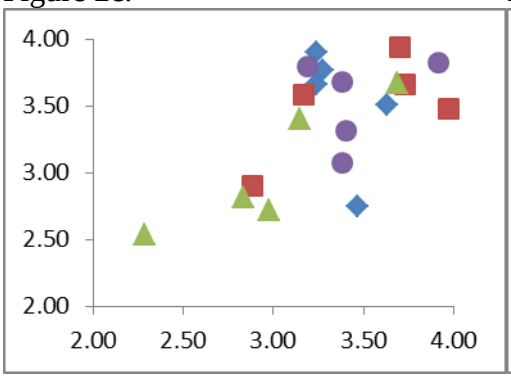


Figure 2e.

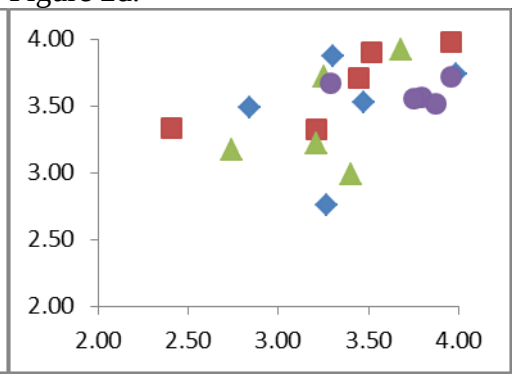
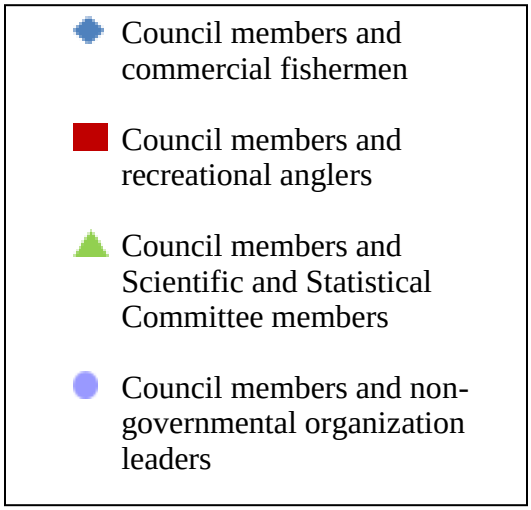


Figure 2f.

Figures 2a-2f. The x-axes are AGREEMENT LEVEL (0 = Lowest Agreement Level; 4 = Highest Agreement Level). The y-axes are ACCURACY LEVEL (0 = Lowest Accuracy Level; 4 = Highest Accuracy Level). Figures 2a and 2b show Mid-Atlantic (MA) and New England (NE) survey responses regarding the definition of ecosystem-based fisheries management, respectively. Figures 2c and 2d show MA and NE survey responses regarding fisheries management practices, respectively. Figures 2e and 2f show MA and NE survey responses regarding fisheries management outcomes, respectively.



3.4. Defining EBFM: Agreement, Accuracy, and Congruency

Agreement:

Agreement Levels were relatively high between both MA (Figure 2a) and NE (Figure 2b) Council member and stakeholder responses for the question: *Please indicate to what extent YOU agree or disagree that the definition of "ecosystem-based fisheries management" should include the following concepts?* (Survey documents, Appendices H, I, J, and K).

Paired Council member and stakeholder mean responses to the question were generally at an *Agreement Level* of 3.0 or higher, with only one MA pair and a few NE pairs below 3.0. Council members and stakeholders in both the MA and NE regions generally responded identically to each other or similarly to the question about what concepts to include in the definition of EBFM. MA and NE Council members and stakeholders responded either *Strongly agree, Agree,* or are *Neutral* to whether the definition of EBFM should include the concepts listed in the survey. The outliers for *Agreement Level* were: NE Council members (*Agree*)/NE commercial fishermen (*Neutral*) for *Developing stakeholder buy-in* (2.86); NE Council members (*Agree*)/NE SSC members (*Strongly agree*) for *Monitoring and enforcing EBFM* (2.97); NE Council members (*Neutral*)/NE SSC members (*Agree*) *Balancing diverse social objectives* (2.86); and MA Council member (*Agree*)/MA commercial fishermen (*Neutral*) for *Developing stakeholder buy-in* (2.77). Specifically, (Tables 5 and 6):

NE and MA stakeholders and Council members *Strongly agreed* or *Agreed* that the definition of EBFM should include the following concepts: *Considering the interactions between the physical, biological, and human factors that affect the health of fisheries; Protecting and/or enhancing habitat; Monitoring and enforcing EBFM; Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries; Adapting to changing biological and social conditions; Incorporating geographically-specific management needs; Including*

flexibility into management strategies; Considering many ecological factors; Engaging stakeholders; Accounting for uncertainty in ecosystems; and *Addressing human needs, including those of fishermen and fishing communities.*

NE and MA stakeholders and Council members *Agreed* or were *Neutral* that the definition of EBFM should include the following concepts: *Developing stakeholder buy-in* and *Balancing diverse social objectives.*

These results suggest that Council members and stakeholders often have the same perspectives about factors that should be included in the definition of EBFM.

Accuracy:

Accuracy Levels are relatively high for both MA (Figure 2a) and NE (Figure 2b) Council member responses for the question: *Please indicate to what extent YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic/New England Region would agree or disagree that the definition of "ecosystem-based fisheries management" should include the following concepts.* (Survey documents, Appendices H, I, J, and K).

Council members generally predicted stakeholder responses to the question with an *Accuracy Level* of 3.0 or higher, suggesting that Council members in both the MA and NE regions correctly predicted or closely predicted stakeholder responses about what concepts to include in the definition of EBFM. The exceptions included the MA Council member prediction of MA commercial fishermen response about *Developing stakeholder buy-in*, which had an *Accuracy Level* of 2.28 (Council members thought commercial fishermen would respond *Strongly Agree* whereas the commercial fisherman actually responded *Neutral)* (Table 6) and the NE Council member prediction of NE commercial fishermen response about *Developing stakeholder buy-in*, which had an *Accuracy Level* of 2.72 (Council members thought commercial

fishermen would respond *Agree* whereas the commercial fisherman actually responded *Neutral)* (Table 5). These results suggest that Council members often are aware of the preferences of stakeholders regarding the definition of EBFM.

Congruency:

Congruency Levels were relatively high between both MA and NE Council member responses and Council member predictions for the question about concepts to include in a definition of EBFM, with all comparison pairs having a *Congruency Level* of 3.0 or higher.

Council member responses and Council member predictions of stakeholder responses were either the same or similar (Tables 5 and 6), suggesting that Council members in both the MA and NE regions predicted stakeholders would hold similar views to themselves regarding what concepts to include in the definition of EBFM.

Table 5. Mean responses (with Standard Error) to the survey question "Please indicate to what extent YOU agree or disagree that the definition of ecosystem-based fisheries management (EBFM) should include the following concepts?" for Council members and stakeholder groups in the New England region. Response categories ranged from Strongly Agree (1) to Strongly Disagree (5). Definitions for the group labels are: NE_MEM is NE Council members; NE_CF is NE commercial fishermen; NE_RA is NE recreational anglers; NE_SSC is NE SSC members; NE_NGO is NE NGO leaders; NEM_CF is NE Council member prediction for NE commercial fishermen; NEM_RA is NE Council member prediction for NE recreational anglers; NEM_SSC is NE Council member prediction for NE SSC members; and NEM_NGO is NE Council member prediction for NE NGO leaders.

VARIABLE	NE_ MEM	NE_ CF	NE_ RA	NE_ SSC	NE_ NGO	NEM_ CF	NEM_ RA	NEM_ SSC	NEM_ NGO
Considering the interactions between the physical, biological, and human factors that affect the health of fisheries.	1.36 (.25)	1.90 (.07)	1.62 (.07)	1.00 (.38)	1.21 (.15)	1.64 (.25)	1.64 (.25)	1.43 (.25)	1.71 (.25)
Protecting and/or enhancing habitat.	1.50 (.25)	1.95 (.06)	1.60 (.07)	1.67 (.38)	1.63 (.15)	2.43 (.25)	1.71 (.25)	1.36 (.25)	1.14 (.25)
Monitoring and enforcing EBFM.	2.23 (.26)	2.34 (.07)	1.83 (.08)	1.20 (.41)	1.75 (.15)	2.58 (.27)	2.42 (.27)	2.00 (.27)	1.42 (.27)
Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries.	2.29 (.25)	1.87 (.06)	1.80 (.07)	1.33 (.38)	2.05 (.15)	1.57 (.25)	1.86 (.25)	1.93 (.25)	2.57 (.25)
Developing stakeholder buy-in.	1.93 (.25)	3.07 (.07)	2.59 (.08)	1.67 (.38)	2.16 (.15)	1.79 (.25)	1.85 (.25)	2.21 (.250	2.07 (.25)
Adapting to changing biological and social conditions.	1.57 (.25)	2.29 (.07)	2.00 (.08)	1.50 (.38)	1.51 (.15)	1.71 (.25)	1.79 (.25)	1.79 (.25)	2.00 (.25)
Incorporating geographically-specific management needs.	1.69 (.26)	2.16 (.07)	1.81 (.08)	1.67 (.38)	1.47 (.15)	1.71 (.25)	2.00 (.25)	1.79 (.25)	1.79 (.25)
Including flexibility into management strategies.	1.86 (.25)	2.00 (.06)	2.05 (.07)	1.33 (.38)	1.74 (.15)	1.36 (.25)	1.57 (.25)	2.14 (.25)	2.86 (.25)
Considering many ecological factors.	1.43 (.25)	2.00 (.07)	1.83 (.07)	1.50 (.38)	1.34 (.15)	1.93 (.25)	2.00 (.25)	1.29 (.25)	1.43 (.25)

Balancing diverse social objectives.	2.64 (.25)	2.41 (.07)	2.41 (.07)	1.50 (.38)	2.28 (.15)	1.79 (.25)	1.79 (.25)	2.21 (.25)	2.50 (.25)
Engaging stakeholders.	1.69 (.26)	2.30 (.07)	2.24 (.08)	1.83 (.38)	1.81 (.15)	1.57 (.25)	1.57 (.25)	1.93 (.25)	1.57 (.25)
Accounting for uncertainty in ecosystems.	1.50 (.25)	2.25 (.07)	2.09 (.08)	1.50 (.38)	1.55 (.15)	2.14 (.25)	1.93 (.25)	1.36 (.25)	1.64 (.25)
Addressing human needs, including those of fishermen and fishing communities.	1.93 (.25)	1.70 (.06)	1.71 (.07)	1.67 (.38)	1.84 (.15)	1.21 (.25)	1.79 (.25)	2.36 (.25)	2.79 (.25)

Table 6. Mean responses (with Standard Error) to the survey question "Please indicate to what extent YOU agree or disagree that the definition of ecosystem-based fisheries management (EBFM) should include the following concepts?" for Council members and stakeholder groups in the Mid-Atlantic Council region. Response categories ranged from Strongly Agree (1) to Strongly Disagree (5). Definitions for the group labels are: MA_MEM is MA Council members; MA _CF is MA commercial fishermen; MA _RA is MA recreational anglers; MA _SSC is MA SSC members; MA _NGO is MA NGO leaders; MAM_CF is MA Council member prediction for MA commercial fishermen; MAM_RA is MA Council member prediction for MA recreational anglers; MAM_SSC is MA Council member prediction for MA SSC members; and MAM_NGO is MA Council member prediction for MA NGO leaders.

VARIABLE	**MA_ MEM**	**MA_ CF**	**MA_ RA**	**MA_ SSC**	**MA_ NGO**	**MAM_ CF**	**MAM_ RA**	**MAM_ SSC**	**MAM_ NGO**
Considering the interactions between the physical, biological, and human factors that affect the health of fisheries.	1.24 (.20)	2.01 (.06)	1.68 (.06)	1.00 (.35)	1.53 (.24)	1.67 (.22)	1.50 (.22)	1.67 (0.22)	1.65 (0.22)
Protecting and/or enhancing habitat.	1.38 (.20)	1.94 (.06)	1.51 (.06)	1.57 (.35)	1.57 (.25)	2.17 (.22)	1.67 (.22)	1.56 (.22)	1.17 (.22)
Monitoring and enforcing EBFM.	2.00 (.21)	2.43 (.06)	1.91 (.07)	1.57 (.35)	1.93 (.24)	2.56 (.23)	2.06 (.23)	1.81 (.23)	1.25 (.23)
Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries.	1.80 (.21)	1.78 (.06)	1.86 (.06)	1.86 (.35)	2.40 (.24)	1.17 (.22)	1.50 (.22)	2.00 (.22)	2.06 (.22)

Developing stakeholder buy-in.	1.95 (.20)	3.19 (.06)	2.47 (.07)	1.57 (.35)	2.20 (.24)	1.47 (.22)	1.53 (.22)	2.24 (.22)	2.06 (.23)
Adapting to changing biological and social conditions.	1.62 (.20)	2.36 (.06)	1.95 (.06)	1.43 (.35)	2.13 (.24)	1.50 (.22)	1.78 (.22)	1.61 (.22)	1.71 (.22)
Incorporating geographically-specific management needs.	1.71 (.20)	2.10 (.06)	1.81 (.06)	1.71 (.35)	2.00 (.24)	1.67 (.22)	1.67 (.22)	1.94 (.23)	1.94 (.23)
Including flexibility into management strategies.	1.81 (.20)	1.81 (.06)	1.86 (.06)	2.14 (.35)	2.47 (.24)	1.30 (.21)	1.63 (.21)	2.17 (.22)	2.33 (.22)
Considering many ecological factors.	1.52 (.20)	2.09 (.06)	1.81 (.06)	1.29 (.35)	1.43 (.25)	2.00 (.21)	1.74 (.21)	1.58 (.21)	1.26 (.21)
Balancing diverse social objectives.	2.14 (.20)	2.52 (.06)	2.51 (.06)	2.14 (.35)	2.79 (.25)	1.70 (.21)	1.95 (.21)	2.39 (.22)	2.17 (.22)
Engaging stakeholders.	1.65 (.21)	2.35 (.06)	2.22 (.07)	1.29 (.35)	1.87 (.24)	1.55 (.21)	1.47 (.21)	2.11 (.21)	(.21)
Accounting for uncertainty in ecosystems.	1.62 (.20)	2.34 (.06)	2.05 (.07)	1.29 (.35)	1.87 (.24)	2.30 (.21)	2.05 (.21)	1.37 (.21)	1.58 (.21)
Addressing human needs, including those of fishermen and fishing communities.	1.81 (.20)	1.49 (.06)	1.73 (.06)	1.86 (.35)	2.47 (.24)	1.10 (.21)	1.47 (.21)	2.33 (.22)	2.50 (.22)

3.5. Management practices: Agreement, Accuracy, and Congruency

Agreement:

Agreement Levels were relatively high between both MA (Figure 2c) and NE (Figure 2d) Council member and stakeholder responses for the question: *How important do YOU think it is that the following practices should be implemented as part of fisheries management in the Mid-Atlantic/New England Fishery Management Council (MAFMC/NEFMC) over the next 10 years?* (Survey documents, Appendices H, I, J, and K).

Paired Council member and stakeholder mean responses to the question were generally at an *Agreement Level* of 3.0 or higher, except for the MA Council member and SSC member pair

for *Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught* (2.61). For example, the most common difference for this question was between *Very important* and *Moderately important*. Council members and stakeholders in both the MA and NE regions generally responded the same or similarly to each other for the question about what EBFM practices should be implemented as part of fisheries management in the MAFMC/NEFMC over the next 10 years. With 2 exceptions, MA and NE council members and stakeholders responded that it was *Very important* or *Moderately important* that all of the EBFM practices listed be implemented as part of fisheries management in the MAFMC/NEFMC over the next 10 years. The exceptions were: NE SSC members responded it was *Extremely important* that *Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions* be implemented and MA SSC members responded it was *Slightly important* that *Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught* be implemented. This indicates that overall, MA and NE Council members and stakeholders both generally support that EBFM practices listed in the survey be implemented as part of fisheries management in the MAFMC/NEFMC over the next 10 years. Specifically, NE and MA stakeholders and Council members responded that it was *Very important* that the following practices should be implemented as part of fisheries management in the MAFMC/NEFMC over the next 10 years (Tables 7 and 8): *Continuing inclusion of stakeholders on the MAFMC/NEFMC Advisory Panel for EBFM; Establishing a specific operational plan for incorporating ecosystem considerations into MAFMC/NEFMC decision making* (MA commercial fishermen responded that this practice is *Moderately important*); and *Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions* (NE SSC members responded that this practice is *Extremely*

important).

NE and MA stakeholders and Council members responded that it was *Very important* or *Moderately important* that the following practices be implemented as part of fisheries management in the MAFMC/NEFMC over the next 10 years: *Rewriting the MAFMC/NEFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based fisheries management (EBFM) principles*; *Incorporating the EBFM approach into MAFMC/NEFMC priorities*; *Integrating social, economic, and community impact analyses into the MAFMC/NEFMC decision making processes*; and *Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught* (MA SSC members responded that this practice is *Slightly important*).

These results suggest that Council members and stakeholders often have the same perspectives about practices that should be implemented in fisheries management in the NE/MA regions over the next 10 years.

Accuracy:

The *Accuracy Levels* are relatively high for both MA (Figure 2c) and NE (Figure 2d) Council member responses to the question: *How important do YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic/New England Region think it is that the following practices should be implemented as part of fisheries management in the Mid-Atlantic/New England Fishery Management Council (MAFMC/NEFMC) over the next 10 years?* (Survey documents, Appendices H, I, J, and K). Council members generally predicted stakeholder responses to the question with an *Accuracy Level* of 3.0 or higher, suggesting that Council members in both the MA and NE regions usually correctly predicted or closely predicted stakeholder responses about what practices should be

implemented as part of fisheries management in the NEFMC/MAFMC over the next 10 years. There was an exception for MA Council member prediction for MA SSC member response about *Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught*, which had an *Accuracy Level* of 2.60 (Council members predicted MA SSC members would respond *Very important* whereas the MA SSC members actually responded *Slightly important*) (Tables 7 and 8). There was an exception for MA Council member prediction for MA recreational angler response about *Establishing a specific operational plan for incorporating ecosystem considerations into MAFMC/NEFMC decision-making* which had an *Accuracy Level* of 2.95 (Council members predicted MA recreational anglers would respond *Moderately important* whereas the MA SSC members actually responded *Very important*) (Tables 7 and 8). There was an exception for NE Council member prediction for NE recreational angler response about *Establishing a specific operational plan for incorporating ecosystem considerations into MAFMC/NEFMC decision making* which had an *Accuracy Level* of 2.85 because Council members predicted NE recreational anglers would respond *Moderately important* whereas the NE recreational anglers actually responded *Very important* (Tables 7 and 8). There was an exception for NE Council member prediction for NE SSC members about *Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions* which had an *Accuracy Level* of 2.81 because Council members predicted NE SSC members would respond *Very important* whereas the NE SSC members actually responded *Extremely important* (Tables 7 and 8).

These results suggest that Council members often know the preferences of stakeholders regarding EBFM practices.

Congruency:

The *Congruency Levels* were relatively high between both MA and NE Council member

responses and Council member predictions for the question about practices to implement as part of fisheries management, with all comparison pairs having a *Congruency Level* of 3.0 or higher.

Council member responses and Council member predictions of stakeholder responses were either the same or similar (Tables 7 and 8), suggesting that Council members in both the MA and NE regions predicted stakeholders would hold similar views to themselves regarding what practices should be implemented as part of EBFM.

Table 7. Mean responses (with Standard Error) to the survey question "How important do YOU think it is that the following practices should be implemented as part of fisheries management in the New England Fishery Management Council (NEFMC) over the next 10 years?" Response categories ranged from Extremely important (1) to Not important (5). Definitions for the group labels are: NE_MEM is NE Council members; NE_CF is NE commercial fishermen; NE_RA is NE recreational anglers; NE_SSC is NE SSC members; NE_NGO is NE NGO leaders; NEM_CF is NE Council member prediction for NE commercial fishermen; NEM_RA is NE Council member prediction for NE recreational anglers; NEM_SSC is NE Council member prediction for NE SSC members; and NEM_NGO is NE Council member prediction for NE NGO leaders.

VARIABLE	NE_ MEM	NE_ CF	NE_ RA	NE_ SSC	NE_ NGO	NEM_ CF	NEM_ RA	NEM_ SSC	NEM_ NGO
Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions.	2.14 (.30)	1.94 (.08)	1.85 (.09)	1.17 (.46)	1.66 (.18)	2.31 (.31)	2.62 (.31)	2.36 (.30)	2.21 (.30)
Establishing a specific operational plan for incorporating ecosystem considerations into MAFMC/NEFMC decision making.	1.93 (.30)	2.41 (.08)	2.00 (.09)	2.17 (.46)	1.61 (.19)	3.00 (.31)	3.15 (.31)	2.23 (.31)	1.85 (.31)
Rewriting the MAFMC/NEFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based	2.50 (.30)	2.38 (.09)	2.43 (.11)	2.50 (.46)	1.71 (.19)	3.23 (.31)	3.15 (.31)	2.50 (.30)	1.86 (.30)

fisheries management (EBFM) principles.									
Incorporating the EBFM approach into MAFMC/NEFMC priorities.	2.23 (.31)	2.68 (.09)	2.39 (.11)	2.17 (.46)	1.60 (.19)	3.00 (.31)	2.92 (.31)	2.46 (.31)	1.62 (.31)
Continuing inclusion of stakeholders on the MAFMC/NEFMC Advisory Panel for EBFM.	1.79 (.30)	2.19 (.08)	2.37 (.10)	1.83 (.46)	1.71 (.19)	1.86 (.30)	1.93 (.30)	2.23 (.31)	2.21 (.30)
Integrating social, economic, and community impact analyses into the MAFMC/NEFMC decision making processes.	2.29 (.30)	2.02 (.08)	2.23 (.09)	1.83 (.46)	1.94 (.19)	1.57 (.30)	1.93 (.30)	2.08 (.31)	2.43 (.30)
Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught.	2.62 (.31)	2.46 (.09)	2.34 (.10)	2.67 (.46)	2.49 (.19)	2.00 (.32)	2.67 (.32)	2.46 (.34)	2.46 (.31)

Table 8. Mean responses (with Standard Error) to the survey question "How important do YOU think it is that the following practices should be implemented as part of fisheries management in the Mid-Atlantic Fishery Management Council (MAFMC) over the next 10 years?" Response categories ranged from Extremely important (1) to Not important (5). Definitions for the group labels are: MA_MEM is MA Council members; MA _CF is MA commercial fishermen; MA _RA is MA recreational anglers; MA _SSC is MA SSC members; MA _NGO is MA NGO leaders; MAM_CF is MA Council member prediction for MA commercial fishermen; MAM_RA is MA Council member prediction for MA recreational anglers; MAM_SSC is MA Council member prediction for MA SSC members; and MAM_NGO is MA Council member prediction for MA NGO leaders.

VARIABLE	MA_ MEM	MA_ CF	MA_ RA	MA_ SSC	MA_ NGO	MAM_ CF	MAM_ RA	MAM_ SSC	MAM_ NGO
Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions.	1.77 (.24)	1.96 (.07)	1.90 (.08)	1.83 (.46)	2.07 (.29)	2.26 (.26)	2.22 (.27)	1.84 (.26)	1.74 (.26)
Establishing a specific operational plan for incorporating ecosystem considerations into MAFMC/ NEFMC decision making.	2.00 (.24)	2.56 (.07)	2.01 (.08)	1.83 (.46)	2.20 (.29)	3.22 (.27)	3.06 (.27)	2.22 (.27)	1.83 (.27)
Rewriting the MAFMC/ NEFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based fisheries management (EBFM) principles.	2.71 (.25)	2.66 (.08)	2.24 (.09)	3.33 (.46)	1.92 (.31)	3.29 (.27)	3.06 (.27)	2.39 (.27)	1.78 (.27)
Incorporating the EBFM approach into MAFMC/ NEFMC	2.05 (.25)	2.81 (.08)	2.25 (.09)	2.67 (.46)	1.86 (.30)	2.90 (.26)	2.50 (.27)	2.11 (.27)	1.50 (.27)

priorities.									
Continuing inclusion of stakeholders on the MAFMC/ NEFMC Advisory Panel for EBFM.	2.00 (.24)	2.24 (.08)	2.27 (.09)	2.17 (.46)	1.86 (.30)	1.60 (.25)	1.68 (.26)	2.05 (.26)	1.84 (.26)
Integrating social, economic, and community impact analyses into the MAFMC/ NEFMC decision making processes.	2.29 (.25)	2.04 (.07)	2.26 (.08)	2.83 (.46)	2.71 (.30)	1.45 (.25)	1.63 (.26)	2.00 (.26)	1.95 (.26)
Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught.	2.44 (.27)	2.66 (.08)	2.49 (.08)	3.83 (.46)	3.00 (.34)	2.80 (.29)	2.73 (.29)	2.43 (.30)	2.19 (.28)

3.6. Management outcomes: Agreement, Accuracy, and Congruency

Agreement:

Agreement Levels are fairly high between both MA (Figure 2e) and NE (Figure 2f) Council member and stakeholder responses for the question: *How strongly would YOU support each one of the following options as a desired outcome for fisheries management in the MAFMC/NEFMC over the next 10 years* (Survey documents, Appendices H, I, J, and K).

Paired Council member and stakeholder mean responses to this question were generally at an *Agreement Level* of 3.0 or higher, except for the MA Council member and SSC member pair. Paired Council member and stakeholder mean responses included *Moderately support*, *Neutral*, and *Moderately oppose.* One exception is that MA SSC members responded *Strongly*

oppose to *A complete, immediate change (0-4 years) from SSFM to EBFM*. Council members and stakeholders in both the MA and NE regions responded with a wider range of answer levels than for the previous two survey questions. Council members and stakeholders expressed varying levels of support for the different options for fisheries management outcomes in the MAFMC/NEFMC over the next 10 years. Specifically, (Tables 9 and 10):

NE and MA stakeholders and Council members *Moderately supported* or were *Neutral* to each one of the following options as a desired outcome for fisheries management in the MAFMC/NEFMC over the next 10 years: *Incremental change from SSFM to EBFM*; *An intermediate change from SSFM to EBFM;* and *A complete, gradual (5-10 years) transition from SSFM to EBFM* (MA SSC members *Moderately oppose* this option*).*

NE and MA stakeholders and Council members were *Neutral or Moderately opposed* to each one of the following options as a desired outcome for fisheries management in the MAFMC/NEFMC over the next 10 years: *Continuation of SSFM* (NE recreational anglers *Moderately support* this option) and *A complete, immediate change (0-4 years) from SSFM to EBFM* (MA SSC members *Strongly oppose* this option).

Overall, the most supported option was: *Incremental change from SSFM to EBFM*. Though this option was followed closely in support by: *An intermediate change from SSFM to EBFM* and *A complete, gradual (5-10 years) transition from SSFM to EBFM* (MA SSC members *Moderately opposed* this option but all NE stakeholders *Moderately supported* this option*).*

The two most unfavorable preferences were those on either end of the time spectrum. These results suggest that Council members and stakeholders do want to begin transitioning to EBFM, either partially or fully, but that they want the evolution to be slow.

Accuracy:

Accuracy Levels are relatively high for both the MA (Figure 2e) and NE (Figure 2f)

Council member responses for the question: *How strongly do YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic/New England Region would support each one of the following options as a desired outcome for fisheries management in the Mid-Atlantic/New England Fishery Management Council (MAFMC/NEFMC) over the next 10 years?* (Survey documents, Appendices H, I, J, and K).

Council members generally predicted stakeholder responses to the question with an *Accuracy Level* of 3.0 or higher, except for predictions for MA SSC members, suggesting that Council members in both the MA and NE regions correctly predicted or closely predicted stakeholder responses regarding which options are desired outcomes for fisheries management in the MAFMC/NEFMC over the next 10 years. Exceptions included MA Council member prediction for MA SSC member response about *A complete, gradual (5-10 years) transition from SSFM to EBFM* (MA Council members thought MA SSC members would respond *Moderately support* whereas the MA SSC members actually responded *Moderately oppose*) (Tables 9 and 10). These results suggest that Council members are usually aware of the preferences of stakeholders regarding EBFM outcomes.

Congruency:

Congruency Levels were relatively high between both MA and NE Council member responses and Council member predictions for the question about outcomes for fisheries management, with most comparison pairs having a *Congruency Level* of 3.0 or higher, except for the MA Council members and SSC members. Council member responses and Council member predictions of stakeholder responses were either the same or similar, (Tables 9 and 10), suggesting that Council members in both the MA and NE regions predicted stakeholders would hold similar views to themselves regarding desired outcomes of EBFM.

Table 9. Mean responses (with Standard Error) to the survey question "How strongly would YOU support each one of the following options as a desired outcome for fisheries management in the New England Fishery Management Council (NEFMC) over the next 10 years?" Response categories ranged from Strongly support (1) to Strongly oppose (5). Definitions for the group labels are: NE_MEM is NE Council members; NE_CF is NE commercial fishermen; NE_RA is NE recreational anglers; NE_SSC is NE SSC members; NE_NGO is NE NGO leaders; NEM_CF is NE Council member prediction for NE commercial fishermen; NEM_RA is NE Council member prediction for NE recreational anglers; NEM_SSC is NE Council member prediction for NE SSC members; and NEM_NGO is NE Council member prediction for NE NGO leaders.

VARIABLE	NE_ MEM	NE_ CF	NE_ RA	NE_ SSC	NE_ NGO	NEM_ CF	NEM_ RA	NEM_ SSC	NEM_ NGO
Continuation of single species fisheries management	3.93 (.32)	2.77 (.09)	2.33 (.10)	2.67 (.49)	4.13 (.20)	3.29 (.32)	3.00 (.32)	3.50 (.32)	3.69 (.34)
Incremental change from single species fisheries management to ecosystem-based fisheries management (EBFM)	2.29 (.32)	2.28 (.09)	2.33 (.10)	1.50 (.49)	2.16 (.200	2.54 (.34)	2.31 (.34)	2.29 (.32)	2.64 (.32)
An intermediate change from single species fisheries management to EBFM	1.92 (.34)	2.62 (.09)	2.40 (.10)	2.67 (.49)	2.17 (.20)	2.75 (.35)	2.50 (.35)	2.39 (.34)	2.62 (.34)
A complete, gradual (5-10 years) transition from single species fisheries management to EBFM	1.85 (.34)	2.37 (.09)	2.40 (.10)	2.17 (.49)	1.89 (.20)	2.85 (.34)	2.69 (.34)	2.08 (.35)	2.17 (.35)
A complete, immediate change (0-4 years) from single species fisheries management to EBFM	3.57 (.32)	2.84 (.09)	2.79 (.10)	4.17 (.49)	2.87 (.20)	4.08 (.34)	3.46 (.34)	3.15 (.34)	2.54 (.340

Table 10. Mean responses (with Standard Error) to the survey question "How strongly would YOU support each one of the following options as a desired outcome for fisheries management in the Mid-Atlantic Fishery Management Council (MAFMC) over the next 10 years?" Response categories ranged from Strongly support (1) to Strongly oppose (5). Definitions for the group labels are: MA_MEM is MA Council members; MA _CF is MA commercial fishermen; MA _RA is MA recreational anglers; MA _SSC is MA SSC members; MA _NGO is MA NGO leaders; MAM_CF is MA Council member prediction for MA commercial fishermen; MAM_RA is MA Council member prediction for MA recreational anglers; MAM_SSC is MA Council member prediction for MA SSC members; and MAM_NGO is MA Council member prediction for MA NGO leaders.

VARIABLE	MA_ MEM	MA_ CF	MA_ RA	MA_ SSC	MA_ NGO	MAM_ CF	MAM_ RA	MAM_ SSC	MAM_ NGO
Continuation of single species fisheries management	3.19 (.26)	2.47 (.08)	2.36 (.09)	2.17 (.49)	3.79 (.32)	2.70 (.27)	2.78 (.28)	3.44 (.28)	4.47 (.29)
Incremental change from single species fisheries management to ecosystem-based fisheries management (EBFM)	1.81 (.26)	2.57 (.08)	2.10 (.09)	1.50 (.49)	2.43 (.32)	2.47 (.28)	2.17 (.28)	1.83 (.28)	2.11 (.28)
An intermediate change from single species fisheries management to EBFM	2.32 (.28)	2.69 (.08)	2.29 (.09)	3.17 (.49)	2.23 (.34)	3.18 (.29)	2.81 (.30)	2.56 (.300	2.06 (.29)
A complete, gradual (5-10 years) transition from single species fisheries management to EBFM	1.95 (.27)	2.71 (.08)	2.22 (.09)	3.67 (.49)	2.57 (.32)	3.05 (.28)	2.56 (.28)	2.20 (.31)	1.65 (.29)
A complete, immediate change (0-4 years) from single species fisheries management to EBFM	3.67 (.26)	3.13 (.08)	2.55 (.09)	4.83 (.49)	2.86 (.32)	4.39 (.28)	3.65 (.29)	3.65 (.29)	2.65 (.29)

3.7. Conclusion

Ideally, if Council members represent their constituents, they would understand the views of the stakeholders they represent regarding Council issues. Council members would then vote on Council issues with their constituents' interests informing member votes. In order for Council members to understand their constituents' opinions on issues, there must be some degree of understanding between Council members and stakeholders. Lack of mutual understanding between Council-related stakeholders could be a barrier to EBFM. The *Coorientation Model* provides a framework to characterize understanding between groups (Leong et al., 2008). In the context of this study, the *Coorientation Model* was used to measure the degree of understanding between Council members and stakeholders, including SSC members (Leong et al., 2008).

Council members and stakeholders in the NE and MA regions generally agreed regarding concepts that should be included in the definition of EBFM and practices that should be implemented in fishery management plans. These attitudes parallel the definitions and practices that experts recommend (Essington & Punt, 2011; Francis et al., 2007; Levin et al., 2009). For the survey questions about EBFM definition, management practices, and management outcomes, Council members usually correctly predicted or closely predicted stakeholder preferences (Tables 5, 6, 7, 8, 9, and 10). Additionally, Council members generally predicted that stakeholders would respond to survey questions the same or similarly as Council members did about EBFM definition, management practices, and management plans. These findings suggest that Council members and stakeholders understand what EBFM entails and have a desire to transition to EBFM, and that Council members either understand and agree with their constituents' attitudes toward EBFM or expect that their constituents agree with their own views.

Council members and stakeholders, as a group, had a slightly wider range of preferences for management outcomes than for concepts to include in an EBFM definition or management

practices to implement. Overall, Council members and stakeholders overwhelmingly supported some level of transition from SSFM to EBFM. Both Council members and stakeholders responded that they wanted some movement toward EBFM, with an incremental, intermediate, or complete gradual (5-10 years) approach. Council members and stakeholders in both regions showed the weakest support for management options for no change from current SSFM or complete immediate change (0-4 years) to EBFM, the extreme ends of the management spectrum. These findings demonstrate that Council members and stakeholders define EBFM as a holistic approach to management, support practices that are believed to be central to EBFM, and desire a gradual transition to EBFM. These stakeholder perspectives are supported by previous research (Biedron, 2014a).

Some results suggested findings that were contrary to what some of the literature on EBFM might suggest (Biedron, 2014a). NE commercial fishermen, NE recreational anglers, and MA commercial fishermen responded *Neutral* to including *Developing stakeholder buy-in* as part of the definition of EBFM. Also, NE Council members, MA commercial fishermen, MA recreational anglers, and MA NGO leaders responded *Neutral* to *Balancing diverse social objectives* in the definition of EBFM. These results suggest that stakeholder buy-in and social objectives were not priorities for some stakeholders.

Regarding the implementation of EBFM, NE survey recipients said it was *Very important* for a fisheries management plan to include *Establishing a specific operational plan for incorporating ecosystem considerations into MAFMC/NEFMC decision making.* All MA survey respondents said it was *Very important*, except for the MA commercial fishermen, who said it was *Moderately important*. These observations suggest that council members and stakeholders would like a specific plan to transition to EBFM and are supported by existing research (Biedron, 2014a).

The survey question asking about which practices should be included in fisheries management produced some unexpected responses. In one case, Council members and stakeholders supported what could be considered a relatively progressive approach *Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught* at a *Very important* or *Moderately important* (MA SSC = *Slightly important*) level (Table 8). All NE and MA survey recipients answered it was *Very important or Moderately important* to include *Rewriting the MAFMC/NEFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based fisheries management (EBFM) principles* in fishery management, which lends support to the idea that the MSFCMA does not offer enough explicit support to EBFM (Tables 7 and 8) and is supported by additional research (Biedron, 2014a).

All NE and MA survey recipients answered it was *Very important or Moderately important* to include *Incorporating the EBFM approach into MAFMC/NEFMC priorities* in fishery management. Both the MAFMC and the NEFMC are moving forward with developing and/or implementing EBFM plans, confirming that they are acknowledging this perspective of the stakeholders they represent (Tables 7 and 8). All NE and MA survey respondents *Agree* and MA SSC members *Strongly agree* that *Accounting for uncertainty in ecosystems* should be included in the definition of EBFM, showing that survey recipients realize that uncertainty is part of the process of transitioning to EBFM.

All NE and MA survey recipients answered it was *Very important* to include *Continuing inclusion of stakeholders on the MAFMC/NEFMC Advisory Panel for EBFM* as a part of fisheries management (Tables 7 and 8). Additionally, all NE and MA survey recipients *Agree* that *Engaging stakeholders* should be included in the definition of EBFM (Tables 5 and 6). Both of these results demonstrate that inclusion of stakeholders in the management process, either in a

specific role, such as Advisory Panel members, or more broadly, outlined by the phrase, *Engaging stakeholders,* is noted as important to NE and MA Council makers and stakeholders. However, this support contrasts with the *Neutral* response from several stakeholder groups for including *Developing Stakeholder Buy-in* in the definition of EBFM. One possible explanation for this inconsistency is that survey responders think it is important for stakeholders to be involved in the management process, but they do not necessarily believe stakeholders need to buy-in to the management process. Another potential explanation is that survey respondents felt differently about the potential inclusion of *Developing Stakeholder Buy-in* into the definition of EBFM, which is a conceptual idea, as compared to their responses to potential actions, *Continuing inclusion of stakeholders on the MAFMC/NEFMC Advisory Panel for EBFM* and *Engaging stakeholders*, to be practiced as part of EBFM (Tables 5, 6, 7, and 8).

Neither low agreement nor low understanding between Council members and stakeholders appears to be a barrier to MA or NE Council transition from SSFM to EBFM. Although Council members and stakeholders have a desire to transition to EBFM, other factors may influence the pace at which the transition occurs, such as a lack of direction, momentum, and understanding of how to initiate and complete the transition, lack of resources, or lack of political will (Biedron, 2014a; Link, 2010; K. L. McLeod & Leslie, 2009; NRC, 2012; SSC, 2010). Since it appears that, at least for the MA and NE regions, most stakeholders agree on definitions, practices, and outcomes for EBFM, the challenge to transitioning to EBFM will be to address other perceived barriers to EBFM (Biedron, 2014b). The current system of SSFM fisheries management is deeply rooted in bureaucratic and institutional history including Council meeting proceedings, government scientist and Council staff responsibilities, data collection plans, legislative interpretation, public participation methods, monitoring and enforcement guidelines, and current management demands (Biedron, 2014a; Link, 2010; K. L. McLeod &

Leslie, 2009; NRC, 2012; SSC, 2010). The study suggests that most Council members and stakeholders in the MA and NE regions want a change from SSFM to EBFM at an incremental, intermediate, or complete, gradual (5-10 years) pace, which may take acceptance of some uncertainty and patience as the transition to EBFM takes on momentum and is adapted to fulfill management needs.

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CHAPTER 5

POTENTIAL BARRIERS AND SOCIAL SCIENCE INFORMATION NEEDS FOR ECOSYSTEM-BASED FISHERIES MANAGEMENT FOR THE NEW ENGLAND AND MID-ATLANTIC FISHERY MANAGEMENT COUNCILS

ABSTRACT

Ecosystem-based fisheries management (EBFM) is a management approach that interests many stakeholders, including fisheries managers and fishermen. Several key reports, including the U.S. Commission on Ocean Policy's *An Ocean Blueprint for the 21st Century* (USCOP, 2004) and the PEW Ocean Commission's *America's Living Oceans: Charting a Course for Sea Change* report (POC, 2003), in addition to President Obama's *National Ocean Policy* (CEQ, 2010) have encouraged using ecosystem-based management (EBM) as a guiding approach to ocean management, including fisheries management. The purpose of our study was to improve understanding of factors contributing to or preventing progress on EBFM implementation in the Mid-Atlantic Fishery Management Council (MAFMC) and New England Fishery Management Council (NEFMC), focusing on Council member and stakeholder beliefs, attitudes, and mutual understanding. We analyzed a total of over 1,000 survey responses about EBFM from commercial fishermen, recreational anglers, non-governmental organization (NGO) leaders, Scientific and Statistical Committee (SSC) members and MAFMC and NEFMC members in the New England (NE) and Mid-Atlantic (MA) regions. Overall, the Council members and stakeholders responded that there were moderate and significant barriers to implementing EBFM and very important and moderately important social science needs for fisheries management. These results may demonstrate that work is needed to reduce the barriers to EBFM and increase

social science information for fisheries management but also that the practice of EBFM is possible, with no immutable obstacle to block its implementation. Making the transition from SSFM to EBFM, at least in the initial stages, may require more coordination between Council members and stakeholders than current management requires, and therefore, understanding between stakeholders will be increasingly important to maximize collaboration and minimize conflicts (Connelly & Knuth, 2002; Freemuth, 1996; Sample, 1994).

Keywords: ecosystem-based fisheries management, New England Fishery Management Council, Mid-Atlantic Fishery Management Council, Coorientation

1. Introduction

Ecosystem-based fisheries management (EBFM) has been emerging as a promising alternative to single species fisheries management (SSFM) in the New England (NE) and Mid-Atlantic (MA) regions of the United States as increasing numbers of policymakers, scientists, and managers acknowledge that the SSFM approach practiced under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (Commerce, 2007) is not sufficient to meet fisheries management objectives (Botsford, Castilla, & Peterson, 1997; Field & Francis, 2006; Francis, Hixon, Clarke, Murawski, & Ralston, 2007; Iles, 1980; Levin, Fogarty, Murawski, & Fluharty, 2009; Pikitch et al., 2004; Sette, 1943). The MSFCMA (Commerce, 2007) is the guiding piece of legislation regarding the federal United States (U.S.) exclusive economic zone. EBFM, a component of the broader concept of ecosystem-based management (EBM), a holistic approach to wildlife and fisheries management (K. L. McLeod & Leslie, 2009), is a management approach that interests many stakeholders, including fisheries managers and fishermen. EBFM is defined as the process of "managing fisheries to coordinate, account

for, and include all factors in a holistic, synthetic, integrated fashion" (Link, 2010). A distinguishing feature of EBFM is that it is based on a multi-species approach, which is a significant change from the SSFM approach currently practiced under the MSFCMA. Several key reports, including the U.S. Commission on Ocean Policy's *An Ocean Blueprint for the 21st Century* (USCOP, 2004) and the PEW Ocean Commission's *America's Living Oceans: Charting a Course for Sea Change* report (POC, 2003), in addition to President Obama's *National Ocean Policy* (CEQ, 2010) have encouraged using EBM as a guiding approach to ocean management, including fisheries management. Historically, there has been an institutional precedent to practice SSFM under the MSFCMA, but the MSFCMA is currently undergoing reauthorization, which may result in changes that would more explicitly mandate the use of EBFM.

When the U.S. Congress enacted the Fishery Conservation and Management Act (FCMA) in 1976 (the precursor to the MSFCMA) (Commerce, 2007), it designated the creation of eight regional fishery management councils within the U.S. Within their respective regions, the FCMA/MSFCMA granted councils the authority to identify which fisheries need management and to develop fisheries management plans, amendments, and suggested regulations to manage the selected fisheries (K. L. McLeod & Leslie, 2009). The South Atlantic, Gulf of Mexico, Mid-Atlantic, New England, Western Pacific, North Pacific, and Pacific regional fishery management councils are currently carrying out some level of EBFM planning or implementation (Dereynier, 2012). The Caribbean Fishery Management Council is presently working to transition from SSFM to island-based fishery management plans (CFMC; Member, 2014). Many previous efforts to transition from SSFM to EBFM have been slow, bureaucratically laborious, or nonexistent (Francis et al., 2007), but over the last several years, both the New England Fishery Management Council (NEFMC) and the Mid-Atlantic Fishery Management Council (MAFMC) have moved toward creating plans to implement EBFM. The

MAFMC, in response to the feedback it received during its *Visioning Project* (MAFMC, 2012b) with stakeholders, is moving forward to develop a plan to implement an Ecosystem Approach to Fisheries Management (EAFM) Guidance Document (MAFMC, 2012a, 2014a). During 2013, the NEFMC suspended progress toward its 2008 decision to develop a plan for and implementation of EBFM. In 2014, the NEFMC voted to include EBFM on its 2014 priority list as a multi-year task, and the Council has held two Ecosystem-Based Management Committee meetings to date in 2014.

The purpose of our study was to improve understanding of factors contributing to or preventing progress on EBFM implementation in the MAFMC and NEFMC, focusing on Council member and stakeholder beliefs, attitudes, and mutual understanding. For our study, the term "stakeholders" refers to commercial fishermen, recreational anglers, non-governmental organization (NGO) leaders, and Scientific and Statistical Committee (SSC) members. We surveyed more than 5,600 commercial fishermen, recreational anglers, NGO leaders, SSC members and MAFMC and NEFMC members in the NE and MA regions about EBFM and received over 1,000 responses. We explored the extent to which Council members and stakeholders agreed about EBFM topics, how well the Council members predicted stakeholder responses, and how similar Council member predictions for stakeholders were to their own responses.

To frame our study, we used the *Coorientation Model* (Connelly & Knuth, 2002; Leong, McComas, & Decker, 2008; J. M. McLeod & Chaffee, 1973) to characterize understanding between the Council and fisheries-related stakeholder groups. In order for Council members to be able to represent and consider their constituents' views in the decision-making processes, there must be some degree of effective communication and mutual understanding between Council members and stakeholders. Lack of understanding between stakeholder perspectives

could influence execution of goals (Scarnecchia, 1988). Using the *Coorientation Model* could help fishery management councils understand more fully what barriers stakeholders perceive in the transition from SSFM to EBFM. Making the transition from SSFM to EBFM, at least in the initial stages, may require more coordination between Council members and stakeholders than current management requires, and therefore, understanding between stakeholders will be increasingly important to maximize collaboration and minimize conflicts (Connelly & Knuth, 2002; Freemuth, 1996; Sample, 1994). Analysis of the quality of understanding between members of the Councils and stakeholder groups allowed for comparisons of beliefs about EBFM and measurements of the extent of understanding between these groups.

The survey methods in this study employed the Coorientation approach used by Leong et al. (2008) to study aspects of communication between managers and stakeholders. Based on mail survey data, we used the *Coorientation Model* to measure the quality, including the *Agreement*, *Accuracy*, and *Congruency*, of communication between the Council members and stakeholders. We defined *Agreement* as "the extent to which the Council members and stakeholders hold the same attitudes and beliefs;" *Accuracy* as "the extent to which Council members' predictions of stakeholder attitudes and beliefs is similar to the stakeholders' actual attitudes and beliefs:" and *Congruency* as "the extent to which the Council members' predictions of stakeholder attitudes and beliefs is similar to their own" (Leong et al., 2008). Coorientation measures allowed us to characterize the similarity of Council member and stakeholder attitudes about EBFM, how accurate Council members are in predicting stakeholder attitudes about EBFM, and how Council member predictions for stakeholders compare to their own responses. *Agreement* was measured between Council members and each stakeholder group for the NE and MA regions. *Accuracy* was measured for Council members in relation to each stakeholder group for the NE and MA regions. *Congruency* was measured for Council member predictions for

each stakeholder group for the NE and MA regions in relation to their own perspectives (See Figure 1, Chapter 1). *Accuracy* and *Congruency* were measured for only the Council members' estimates of each of the stakeholder groups' perspectives, and not vice versa, because the Council members directly vote on policy decisions about EBFM. From the perspective of Council members and stakeholders, we asked specifically: *What are potential barriers to the Mid-Atlantic Fishery Management Council (MAFMC)/New England Fishery Management Council (NEFMC) in implementing ecosystem-based fisheries management (EBFM)?* and *What types of social science information are needed to support informed decisions for federally-managed fisheries in the Mid-Atlantic/New England region?* Specifically, the objective of our study was to improve understanding of Council member and stakeholder beliefs, attitudes, and mutual understanding about the potential barriers to and the social science information needs to support implementation of EBFM in the NE and MA regions.

Understanding how Council members and stakeholders perceive barriers to EBFM and social science informational needs for fisheries management and how well members understand the perceptions of other stakeholders may contribute to efforts to foster adoption of EBFM as an approach for managing marine fisheries.

2. Methods

2.1. Mail survey methodology

We used a mail survey to study perceptions about EBFM between Council members, SSC members, and fisheries-related groups (commercial fishermen, recreational anglers, and NGO leaders) in the NE and MA regions and to characterize understanding between Council members and stakeholders based on the *Coorientation Model*. We measured *Agreement*, *Accuracy*, and *Congruency* (Connelly & Knuth, 2002; Leong et al., 2008) and compared Council member beliefs and attitudes about EBFM to stakeholder beliefs and attitudes about EBFM.

We developed two versions of the mail survey. The "decision maker" survey was sent to Council members and SSC members from the NE and MA regions. The "stakeholder" survey was sent to commercial fishermen, recreational fishermen, and NGO leaders working on fisheries policy in the NE and MA regions. From January 16, 2013 until March 1, 2013, we sent up to four mailings to selected NE and MA survey recipients to encourage participation (Dillman, 1978).

We calculated the "required sample size for accuracy level of +/- 5% for various population sizes (N=Inf.) and Confidence Levels (% of Population with Given Characteristic = 50%)," (Kish, 1965) for each stakeholder group. We distributed a total of 5,651 surveys in the NE and MA regions to selected individuals, including all NEFMC and MAFMC members and SSC members, to leaders of NGOs with interests in federal fisheries in the NE and MA regions, and to individuals randomly selected from the Councils' lists of contacts for commercial fishermen and recreational anglers and from lists of commercial and recreational fishing permit holders in NE and the MA. Some individuals are members of both the NEFMC and the MAMFC. Due to their central positions on the councils, each of these dual-council participants was invited to respond to both surveys. Full versions of the NE and MA decision maker and stakeholder surveys are included in Appendices H, I, J, and K. Our study protocol was reviewed by the Cornell University Institutional Review Board and deemed exempt (Appendix E).

2.2. Identification of survey recipients

We compiled NEFMC and MAFMC member and SSC member contact information from the NEFMC (NEFMC, 2014) and MAFMC (MAFMC, 2014b) websites. We created the list of commercial fishermen and recreational anglers by randomly selecting a subsample of individual names from the list of permit holders for each group from both the NE and MA regions. We included only commercial fishermen and recreational anglers whose interests were related to

federally-regulated fisheries within either the region regulated by the NEFMC or the MAFMC. We consulted a publicly accessible government-supported database (NERO, 2012) to identify the sample of survey recipients from the commercial fishing industry in the NE and MA regions. We compiled the contact information of individuals listed as holders of NOAA Fisheries Northeast Region Vessel Operator cards (permits) on the National Oceanic and Atmospheric Administration's website (as of 7/9/12) (NERO, 2012). The Northeast region includes both the NE and MA Council regions. We identified permit holders as from the MA or NE Council area based on whether the affiliated address was within the NE (Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut) or MA (New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina) region. We removed individuals with addresses outside of the NE or MA regions. We created separate lists for current operators for the NE and the MA regions, and each list was sorted by alphabetical order by last name and then first name. It is possible that survey recipients selected from the "operators" list may not actually have been commercial fishermen or operating their vessels at the time of survey distribution.

Marine recreational permitting lists are controlled by state governments, which release permitting information on a case-by-case basis. Only Virginia, Pennsylvania, Connecticut, and Massachusetts agreed to make their recreational permitting lists available for our study; recreational angler survey responses therefore represent only recreational permit holders from those states. We randomly sampled marine recreational fishermen from each of the 2011-2012 state registries of registered marine recreational anglers from Pennsylvania, Virginia, Massachusetts, and Connecticut. These lists contained residents and nonresidents seeking a marine recreational fishing license for the respective state. We removed registrants under the age of eighteen from data sets before sampling. The names in each state's database were listed in alphabetical order by last name, then first name. The spreadsheets for Pennsylvania and Virginia

contained data from combined years (2011-2012) and Massachusetts and Connecticut had separate sheets for 2011 and 2012, which were combined before sampling. We selected samples for each of the four states from the combined 2011 and 2012 data for each state. We reviewed selected recipients to confirm that the same name was not sampled twice.

We used several techniques to compile the NGO leader stakeholder list for marine fisheries organizations in the NE and MA regions. We conducted an internet search for the phrases "nongovernmental organizations in New England fisheries" and "nongovernmental organizations in Mid-Atlantic fisheries." Although the search focused on environmental nongovernmental organizations related to marine fisheries in the NE and MA regions, it also included other organizations related to marine fisheries in the NE and MA regions. Once an organization was identified that met the search criteria, the contact information for either the leader of the organization, or the person who was most directly related to marine fisheries for the organization, was included in the sample. Additionally, we reviewed sign-in sheets and observation notes from NEFMC and MAFMC full meetings from 2011 and 2012 and included the representatives of those marine fisheries-related organizations listed in the survey sample. We also used contact lists provided by the Council staff members to identify leaders of marine fisheries organizations in the NE and MA regions. Because the final list of NGO contacts was relatively short, we sent surveys to all NGO contacts that had been identified through the various identification processes.

2.3. Non-respondent phone follow-up

We conducted non-respondent phone follow-up data collection, consisting of a shortened version of the mail survey conducted by telephone, from March 28, 2013 through April 16, 2013, with 200 survey non-respondents (50 NE commercial fishermen, 50 NE recreational anglers, 50 MA commercial fishermen, and 50 MA recreational anglers) (Loker, Decker, & Schwager, 1999;

Tarrant, Manfredo, Bayley, & Hess, 1993). We did not include Council members and NGO leaders in the non-respondent phone follow-up because these group sizes were small initially.

The Survey Research Institute at Cornell University (SRI) conducted the non-respondent telephone survey follow-up. We provided SRI with a sample of 4,040 non-respondent fisheries stakeholders representing the four strata (two fishing regions and two types of permits). SRI randomly selected a total of 1,411 stakeholders from across all four strata combined for the follow-ups. SRI attempted Lexis-Nexis lookups (using names and addresses) for the 1,032 of the 1,411 randomly sampled stakeholders whose records did not include a phone number. Overall, from the 1,411 randomly selected stakeholders, by combining the stakeholders whose records initially included phone numbers and those stakeholders whose phone numbers were found using Lexis-Nexis, SRI's final working sample of non-respondents to contact by phone was 1,033. SRI completed a total of 200 phone interviews, with 50 interviews in each of the four strata.

2.4. Chi-square test for association

To analyze the results from the non-respondent phone follow-ups, we used a *Chi-square test for association* (*Pearson Chi-Square* was used since neither variable was dichotomous) in SPSS ("IBM SPSS Statistics for Windows, Version 21.0," 2012) to compare the survey responses between the initial survey response group and the non-response group to determine if survey group was statistically independent of survey response at the $P < 0.05$ level.

2.5. Survey data analyses

We entered the data from the returned questionnaires into a computerized data file and used SPSS ("IBM SPSS Statistics for Windows, Version 21.0," 2012) for analysis. We used a *Two-Way ANOVA* and a post-hoc *Tukey* test, assuming equal variances, to analyze the data and calculate agreement, accuracy, and congruency between decision makers and stakeholders.

To calculate *Agreement Level* between Council members and one of the relevant stakeholder groups from the appropriate region, we calculated the mean survey responses for each stakeholder group to each question. All survey responses were measured on a Likert scale of 1-5 (6's, "Don't Know" responses were removed from the data set for analysis). We then calculated the absolute value of the difference in mean response between the two groups. The maximum possible difference in mean response was 4, which would represent the lowest possible agreement. The minimum difference in mean response was 0, which would be complete agreement. To represent *Agreement Level* as directly correlated to agreement, *Agreement Level* was calculated by subtracting the absolute value of the mean response difference from 4. Therefore, 4 = Highest *Agreement Level* and 0 = Lowest *Agreement Level* where *AGREEMENT LEVEL = {4 - (Absolute value of mean response difference)}*.

To calculate *Accuracy Level* between Council members and one of the relevant stakeholder groups from the appropriate region, we calculated the mean survey responses for each stakeholder group to each question as well as Council member mean predictions of each stakeholder group's responses to each question. We then calculated the absolute value of the difference in the mean prediction of Council members for the stakeholder group in question and the mean response of the stakeholder group. The maximum possible difference in mean response was 4, which would represent the lowest possible accuracy. The minimum difference in mean response was 0, which would be complete accuracy. To represent *Accuracy Level* as directly correlated to accuracy, *Accuracy Level* was calculated by subtracting the absolute value of the mean response difference from 4. Therefore, 4 = Highest *Accuracy Level* and 0 = Lowest *Accuracy Level* where *ACCURACY LEVEL = {4 - (Absolute value of mean response difference)}*.

To calculate *Congruency Level* between Council members and one of the relevant

stakeholder groups from the appropriate region, we calculated the mean survey responses of Council members to each question as well as Council member mean predictions of each stakeholder group's responses to each question. We then calculated the absolute value of the difference in the mean prediction of Council members and the mean response predicted for the stakeholder group in question. The maximum possible difference in mean response was 4, which would represent the lowest possible congruency. The minimum difference in mean response was 0, which would be complete congruency. To represent *Congruency Level* as directly correlated to congruency, *Congruency Level* was calculated by subtracting the absolute value of the mean response difference from 4. Therefore, 4 = Highest *Congruency Level* and 0 = Lowest *Congruency Level* where *CONGRUENCY LEVEL = {4 - (Absolute value of mean response difference)}*.

3. Results and Discussion

3.1. Survey response rate and non-respondent bias

The overall survey response was 1,083 returns out of 5,651 surveys mailed; the response rate varied by group from 57% to 14% (See Table 4, Chapter 4). Only recreational anglers from the states of Virginia, Pennsylvania, Connecticut, and Massachusetts allowed us access to their recreational permitting lists and were therefore included in the survey. As a result, some response biases may have occurred since a large number of states' recreational anglers were not represented in the survey. It seems reasonable that in New England, Maine's recreational anglers may have responded to the survey differently than the survey respondents from Massachusetts and Connecticut since Maine is a large state at the northern edge of New England, which could have a different array of stocks than Massachusetts and Connecticut, which are farther south. In the Mid-Atlantic, stakeholders from New York, New Jersey, Delaware, Maryland, and North Carolina are all likely to be different from the survey responses of Pennsylvania, which has only

a small sliver of access to marine waters, and Virginia, which may not have as vibrant a fishing industry as other areas. Although response rates are relatively low for commercial and recreational fisheries stakeholder groups in each region, we found no evidence of non-response bias.

3.2. Chi-square test for association to assess non-response bias

To analyze the results from the non-respondent phone follow-ups, we used a *Chi-square test for association* (*Pearson Chi-Square* was used since neither variable was dichotomous) in SPSS ("IBM SPSS Statistics for Windows, Version 21.0," 2012) to compare the survey responses between the initial survey response group and the non-response group to determine if survey group was statistically independent of survey response at the $P < 0.05$ level.

For the *Chi-square test for association* between survey set and familiarity with EBFM, all expected cell frequencies were greater than 5. There was a statistically significant (χ^2 (3) = 19.659, p = .000), but low association ($\varphi = 0.133$, p = .000) between survey set and familiarity with EBFM. *Cramer's V* was used since neither variable is dichotomous.

For the *Chi-square test for association* between survey set and familiarity with *"New England Fishery Management Council" or "Mid-Atlantic Fishery Management Council,"* all expected cell frequencies were greater than 5. There was a statistically significant (χ^2 (3) = 12.771, p = .005), but low association ($\varphi = 0.107$, p = .005) between survey set and familiarity with the term *"New England Fishery Management Council"* or *"Mid-Atlantic Fishery Management Council"*. *Cramer's V* was used since neither variable is dichotomous.

Based on these analyses, no corrections were made to the data to correct for non-response bias.

3.3. Survey responses: Agreement Levels and Accuracy Levels

Agreement Levels and *Accuracy Levels* for responses to the survey questions about

potential barriers to and social science needs for EBFM are described below (Figures 3a-d).

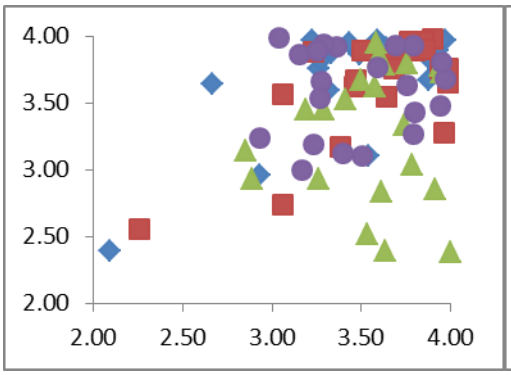


Figure 3a.

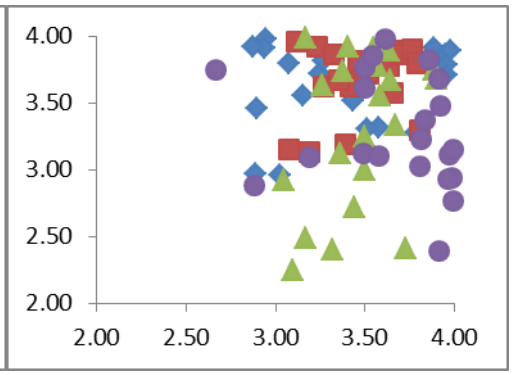


Figure 3b.

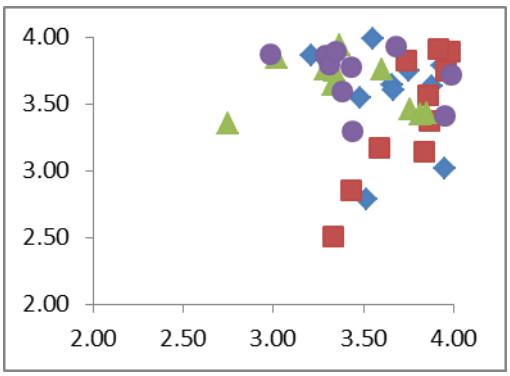


Figure 3c.

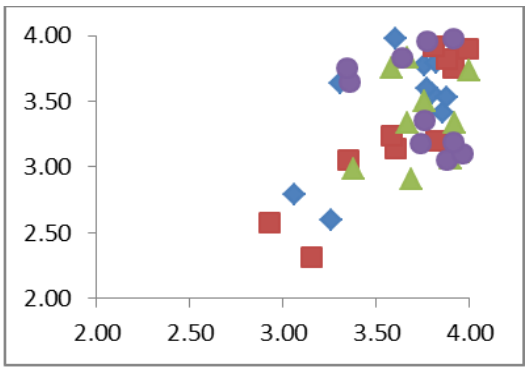
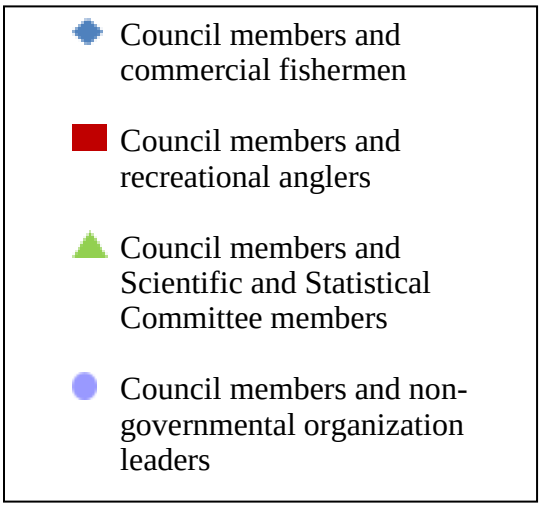


Figure 3d.

Figures 3a-d. The x-axes are AGREEMENT LEVEL (0 = Lowest Agreement Level; 4 = Highest Agreement Level). The y-axes are ACCURACY LEVEL (0 = Lowest Accuracy Level; 4 = Highest Accuracy Level). Figures 3a and 3b show Mid-Atlantic (MA) and New England (NE) survey responses regarding potential barriers to ecosystem-based fisheries management, respectively. Figures 3c and 3d show MA and NE survey responses regarding social science needs for ecosystem-based fisheries management, respectively.



3.4. Barriers to EBFM: Agreement, Accuracy, and Congruency

Agreement:

Agreement Levels were relatively high between both MA (Figure 3a) and NE (Figure 3b) Council member and stakeholder responses for the question: *How significant do YOU think each of the following is as a potential barrier to the Mid-Atlantic Fishery Management Council (MAFMC) or New England Fishery Management Council (NEFMC) in implementing ecosystem-based fisheries management (EBFM)?* (Survey documents, Appendices H, I, J, and K). The majority of paired Council member and stakeholder mean responses to the question were at an *Agreement Level* of 3.0 or higher, but the highest proportion of pair responses below 3.0 were those of the NE Council member and NE commercial fishermen pairs. Council members and stakeholders in both the MA and NE regions generally responded identically or similarly to the question about barriers to EBFM. The outliers for *Agreement Level* were: MA Council members (*Minor barrier*)/MA Commercial fishermen (*Moderate barrier*) and MA Council members (*Minor barrier*)/MA Recreational fishermen (*Moderate barrier*) for *Lack of NEFMC/MAFMC leadership* (2.09 and 2.25) (Tables 11 and 12).

The variable which most respondents labeled as a *Significant barrier* was *Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management*. Council member and stakeholder responses regarding potential barriers to EBFM are summarized below.

NE and MA stakeholders and Council members responded that each of the following is either a *Moderate barrier* or *Significant barrier* to implementing EBFM: *There are so many variables that must be considered; Council structure is currently organized to deal with individual fishery management plans; Lack of science to support EBFM plans; Lack of definitive, achievable action plan for EBFM; Lack of funding; Lack of reliable fish population models*

based on ecosystem-based principles; Lack of political support; Concern about lower fishing quotas; Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management; Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management; Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management; and *Insufficient scientific data to support the transition to EBFM*.

NE and MA stakeholders and Council members think that each of the following is a *Minor barrier*, *Moderate barrier*, or *Significant barrier* to implementing EBFM: *Constrained by Magnuson-Stevens Fishery Conservation and Management Act; Lack of legislation clearly and specifically mandating EBFM; Lack of stakeholder buy-in; Lack of a leader to guide the way to adoption of EBFM; Lack of workable examples and/or case studies of EBFM; Lack of NEFMC/MAFMC leadership; Overly precautionary management; Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than they are now under current management;* and *Concern that if EBFM is implemented, then there will be more administrative requirements than there are now under current management*.

These results suggest that Council members and stakeholders perceive that there are many significant, moderate, and/or minor potential barriers to the implementation of EBFM, but no potential barriers that are not a barrier and no insurmountable barriers.

Accuracy:

Accuracy Levels are relatively high for both MA (Figure 3a) and NE (Figure 3b) Council member responses for the question: *How significant do YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic or New England Region think each of the following is as a potential barrier to the*

Mid-Atlantic Fishery Management Council (MAFMC) or New England Fishery Management Council (NEFMC) in implementing ecosystem-based fisheries management (EBFM)? (Survey documents, Appendices H, I, J, and K). Council members generally predicted stakeholder responses to the question with an *Accuracy Level* of 3.0 or higher, suggesting that Council members in both the MA and NE regions correctly predicted or closely predicted stakeholder responses about potential barriers to EBFM. However, a number of NE and MA pair responses were below 3.0, including NE Council member and NE SSC member responses, NE Council member and NGO leader pair responses, and MA Council member and MA SSC member responses.

The potential barriers for which all of the exception stakeholder pairs had *Accuracy Levels* lower than 3.0 were: *Concern about lower fishing quotas*; *Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management;* and *Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management* (Tables 11 and 12).

Several interesting *Accuracy Level* outliers were: NE Council member prediction (*Minor barrier*) of NE SSC member response (*Significant barrier*) about *Concern that if EBFM is implemented, then there will be more administrative requirements than there are now under current management*; NE Council member prediction (*Minor barrier*) of NE SSC member response (*Significant barrier*) about *Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management*; MA Council member prediction (*Minor barrier*) of MA SSC member response (*Significant barrier*) for *Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than they are now under current management*; MA Council member prediction

(*Minor barrier*) of MA SSC member response (*Significant barrier*) for *Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management*; and MA Council member prediction (*Minor barrier*) of MA SSC member response (*Significant barrier*) for *Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management* (Tables 11 and 12).

These results suggest that Council members often perfectly or closely predict the preferences of stakeholders regarding potential barriers to the implementation of EBFM. The exceptions illustrate that Council members underestimated how significant SSC members think administrative requirements, loss of profits, complexity of management, and lower quotas are as barriers to EBFM.

Congruency:

Congruency Levels were relatively high between both MA and NE Council member responses and Council member predictions for the question about potential barriers to EBFM, with most comparison pairs having a *Congruency Level* of 3.0 or higher (0 = no *Congruency* and 4 = perfect *Congruency*) (Tables 11 and 12). Council member and NGO leader pairs in both the NE and MA regions had *Congruency Levels* below 3.0 for the highest number of variables compared to the other stakeholder pairs, but overall, Council member and NGO leader pairs had *Congruency Levels* over 3.0 for most variables.

Most Council member responses and Council member predictions of stakeholder responses were either the same or similar (Tables 11 and 12), suggesting that Council members in both the MA and NE regions predicted stakeholders would hold similar views to themselves regarding potential barriers for EBFM.

Table 11. Mean responses (with Standard Error) to the question "How significant do YOU think each of the following is as a potential barrier to the New England Fishery Management Council (NEFMC) in implementing ecosystem-based fisheries management (EBFM)?" Response categories ranged from Not a barrier (1) to Insurmountable barrier (5). Definitions for the group labels are: NE_MEM is NE Council members; NE_CF is NE commercial fishermen; NE_RA is NE recreational anglers; NE_SSC is NE SSC members; NE_NGO is NE NGO leaders; NEM_CF is NE Council member prediction for NE commercial fishermen; NEM_RA is NE Council member prediction for NE recreational anglers; NEM_SSC is NE Council member prediction for NE SSC members; and NEM_NGO is NE Council member prediction for NE NGO leaders.

VARIABLE	NE_ MEM	NE_ CF	NE_ RA	NE_ SSC	NE_ NGO	NEM_ CF	NEM_ RA	NEM_ SSC	NEM_ NGO
There are so many variables that must be considered.	3.50 (.28)	3.45 (.08)	3.15 (.10)	4.00 (.43)	3.32 (.17)	3.58 (.30)	3.58 (.30)	3.00 (.30)	2.54 (.29)
Council structure is currently organized to deal with individual fishery management plans.	3.29 (.28)	3.36 (.08)	2.98 (.10)	2.83 (.43)	3.37 (.17)	3.09 (.31)	3.09 (.31)	2.92 (.29)	2.85 (.29)
Lack of science to support EBFM plans.	3.50 (.28)	3.52 (.08)	3.14 (.10)	3.83 (.43)	0 (.18)	3.64 (.31)	3.36 (.31)	3.17 (.30)	2.77 (.29)
Lack of definitive, achievable action plan for EBFM.	3.00 (.28)	3.50 (.09)	3.30 (.10)	3.50 (.43)	3.17 (.18)	3.25 (.30)	3.17 (.30)	2.75 (.30)	2.54 (.29)
Lack of funding.	3.21 (.28)	3.33 (.09)	3.79 (.10)	4.17 (.43)	3.73 (.18)	3.42 (.30)	3.42 (.30)	3.08 (.30)	2.85 (.29)
Constrained by Magnuson-Stevens Fishery Conservation and Management Act.	3.93 (.28)	3.50 (.09)	3.20 (.12)	3.33 (.43)	2.59 (.19)	2.82 (.31)	2.82 (.31)	3.25 (.30)	2.85 (.29)
Lack of legislation clearly and specifically mandating EBFM.	3.21 (.28)	3.43 (.08)	3.41 (.11)	3.33 (.43)	2.83 (.18)	2.70 (.33)	2.70 (.33)	3.08 (.30)	2.85 (.29)
Lack of reliable fish population models based on ecosystem-based principles.	3.50 (.28)	3.54 (.08)	3.26 (.10)	3.40 (.47)	3.00 (.18)	3.33 (.30)	3.17 (.30)	3.08 (.30)	2.62 (.29)
Lack of stakeholder buy-in.	3.00 (.28)	3.04 (.09)	3.21 (.11)	2.17 (.43)	2.97 (.18)	3.33 (.30)	3.00 (.30)	2.18 (.31)	2.08 (.30)
Lack of a leader to guide the way to adoption of EBFM.	2.46 (.29)	3.44 (.09)	3.27 (.11)	1.83 (.43)	3.27 (.17)	2.40 (.33)	2.40 (.33)	2.10 (.33)	2.36 (.31)

Lack of political support.	2.93 (.28)	3.42 (.09)	3.54 (.10)	2.50 (.43)	3.35 (.18)	2.73 (.31)	2.73 (.31)	2.27 (.31)	2.46 (.31)
Lack of workable examples and/or case studies of EBFM.	2.69 (.29)	3.44 (.09)	3.21 (.10)	3.33 (.43)	2.78 (.18)	3.17 (.30)	3.00 (.30)	2.46 (.31)	2.46 (.31)
Lack of NEFMC/MAFMC leadership.	2.36 (.32)	3.48 (.09)	3.29 (.11)	2.00 (.47)	3.49 (.17)	2.44 (.35)	2.44 (.35)	2.11 (.35)	2.36 (.31)
Overly precautionary management	2.54 (.29)	3.59 (.08)	3.31 (.10)	1.80 (.47)	2.53 (.17)	3.62 (.29)	3.39 (.29)	2.17 (.30)	1.46 (.29)
Concern about lower fishing quotas.	2.93 (.28)	3.66 (.08)	3.41 (.09)	3.20 (.47)	2.84 (.17)	3.85 (.29)	3.69 (.29)	1.62 (.29)	1.23 (.29)
Insufficient scientific data to support the transition to EBFM.	3.14 (.28)	3.71 (.08)	3.35 (.10)	3.50 (.43)	2.69 (.18)	3.23 (.29)	3.15 (.29)	3.17 (.30)	2.54 (.29)
Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than they are now under current management.	2.77 (.29)	3.87 (.08)	3.42 (.10)	3.60 (.47)	2.77 (.18)	3.33 (.30)	3.08 (.30)	2.09 (.31)	1.92 (.30)
Concern that if EBFM is implemented, then there will be more administrative requirements than there are now under current management.	2.92 (.30)	3.84 (.08)	3.46 (.10)	3.60 (.47)	2.72 (.18)	3.64 (.31)	3.27 (.31)	2.00 (.33)	1.75 (.30)
Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management.	2.69 (.29)	3.76 (.08)	3.58 (.10)	3.60 (.47)	2.70 (.18)	3.85 (.29)	3.54 (.29)	1.85 (.29)	1.46 (.29)

Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management.	2.79 (.28)	3.63 (.08)	3.27 (.10)	3.20 (.47)	2.64 (.18)	3.18 (.31)	3.00 (.31)	2.74 (.30)	2.46 (.29)
Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management.	2.64 (.28)	3.77 (.08)	3.32 (.10)	3.20 (.47)	2.61 (.18)	3.85 (.29)	3.46 (.29)	1.92 (.29)	1.53 (.29)

Table 12. Mean responses (with Standard Error) to the question "How significant do YOU think each of the following is as a potential barrier to the Mid-Atlantic Fishery Management Council (MAFMC) in implementing ecosystem-based fisheries management (EBFM)?" Response categories ranged from Not a barrier (1) to Insurmountable barrier (5). Definitions for the group labels are: MA_MEM is MA Council members; MA _CF is MA commercial fishermen; MA _RA is MA recreational anglers; MA _SSC is MA SSC members; MA _NGO is MA NGO leaders; MAM_CF is MA Council member prediction for MA commercial fishermen; MAM_RA is MA Council member prediction for MA recreational anglers; MAM_SSC is MA Council member prediction for MA SSC members; and MAM_NGO is MA Council member prediction for MA NGO leaders.

VARIABLE	**MA_ MEM**	**MA_ CF**	**MA_ RA**	**MA_ SSC**	**MA_ NGO**	**MAM_ CF**	**MAM_ RA**	**MAM_ SSC**	**MAM_ NGO**
There are so many variables that must be considered.	3.59 (.23)	3.53 (.07)	3.22 (.08)	3.00 (.40)	2.87 (.27)	3.72 (.24)	3.41 (.25)	3.47 (.25)	2.53 (.25)
Council structure is currently organized to deal with individual fishery management plans.	3.23 (.23)	3.14 (.07)	3.12 (.09)	3.29 (.40)	3.20 (.27)	3.21 (.28)	3.14 (.28)	3.06 (.25)	2.88 (.26)
Lack of science to support EBFM plans.	3.71 (.23)	3.75 (.07)	3.18 (.09)	3.00 (.40)	3.08 (.29)	3.78 (.24)	3.56 (.24)	3.56 (.24)	3.00 (.25)
Lack of definitive, achievable action plan for EBFM.	3.18 (.23)	3.59 (.07)	3.34 (.09)	3.43 (.40)	3.43 (.40)	3.56 (.24)	3.29 (.25)	3.22 (.24)	3.06 (.25)
Lack of funding.	3.38 (.23)	3.64 (.08)	3.74 (.09)	3.43 (.40)	3.33 (.30)	3.53 (.25)	3.28 (.24)	3.71 (.25)	3.53 (.25)

Constrained by Magnuson-Stevens Fishery Conservation and Management Act.	3.15 (.24)	3.61 (.08)	3.18 (.11)	2.00 (.40)	3.09 (.32)	2.71 (.28)	2.46 (.29)	2.86 (.28)	2.57 (.28)
Lack of legislation clearly and specifically mandating EBFM.	2.80 (.24)	3.48 (.08)	3.42 (.09)	2.43 (.40)	3.00 (.28)	3.08 (.29)	2.58 (.30)	2.64 (.28)	2.43 (.28)
Lack of reliable fish population models based on ecosystem-based principles.	3.71 (.23)	3.84 (.07)	3.40 (.09)	2.60 (.47)	3.00 (.27)	3.67 (.24)	3.22 (.24)	3.67 (.24)	3.06 (.25)
Lack of stakeholder buy-in.	3.21 (.24)	3.28 (.08)	3.23 (.09)	3.43 (.40)	3.00 (.27)	3.18 (.25)	2.88 (.26)	2.47 (.27)	2.27 (.27)
Lack of a leader to guide the way to adoption of EBFM.	2.40 (.24)	3.47 (.08)	3.34 (.09)	3.14 (.40)	3.00 (.28)	2.43 (.28)	2.08 (.29)	2.07 (.28)	2.13 (.26)
Lack of political support.	2.72 (.25)	3.50 (.08)	3.67 (.08)	3.14 (.40)	2.93 (.28)	3.46 (.29)	3.23 (.29)	2.77 (.29)	2.86 (.28)
Lack of workable examples and/or case studies of EBFM.	2.74 (.24)	3.48 (.07)	3.27 (.09)	3.14 (.40)	2.43 (.28)	3.24 (.25)	2.93 (.27)	3.00 (.25)	2.50 (.26)
Lack of NEFMC/MAFMC leadership.	1.50 (.25)	3.41 (.08)	3.25 (.10)	2.00 (.40)	2.57 (.28)	1.80 (.27)	1.80 (.27)	1.67 (.27)	1.81 (.26)
Overly precautionary management	2.41 (.23)	3.75 (.07)	3.18 (.08)	2.67 (.43)	2.00 (.28)	3.39 (.24)	3.06 (.25)	2.00 (.25)	1.77 (.25)
Concern about lower fishing quotas.	3.23 (.23)	3.80 (.07)	3.43 (.08)	3.14 (.40)	2.73 (.27)	3.85 (.23)	3.32 (.24)	2.00 (.24)	1.83 (.24)
Insufficient scientific data to support the transition to EBFM.	3.81 (.23)	3.93 (.07)	3.32 (.09)	3.00 (.40)	2.85 (.29)	3.60 (.23)	3.42 (.24)	3.56 (.24)	2.83 (.24)
Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than they are now under current management.	3.20 (.24)	3.87 (.07)	3.42 (.08)	3.67 (.43)	2.47 (.27)	3.74 (.24)	3.39 (.24)	2.19 (.26)	2.00 (.25)
Concern that if EBFM is implemented, then there will be more administrative requirements than there are now	3.11 (.25)	3.84 (.07)	3.43 (.08)	3.50 (.43)	2.27	3.65 (.25)	3.19 (.26)	2.33 (.27)	2.13 (.26)

under current management.									
Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management.	3.50 (.25)	3.86 (.07)	3.56 (.09)	3.50 (.43)	2.67 (.27)	3.95 (.23)	3.32 (.24)	1.88 (.25)	1.67 (.24)
Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management.	3.25 (.24)	3.75 (.07)	3.10 (.09)	2.83 (.43)	2.50 (.28)	3.63 (.26)	3.20 (.27)	2.89 (.24)	2.39 (.24)
Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management.	3.30 (.24)	3.81 (.07)	3.28 (.08)	3.67 (.43)	2.53 (.27)	3.95 (.23)	3.53 (.24)	2.06 (.25)	1.72 (.24)

3.5. Social science needs: Agreement, Accuracy, and Congruency

Agreement:

Agreement Levels were relatively high between both MA (Figure 3c) and NE (Figure 3d) Council member and stakeholder responses for the question: *How important do YOU think the following types of social science information are to support informed decisions for federally-managed fisheries in the Mid-Atlantic or New England region?* (Survey documents, Appendices H, I, J, and K). The majority of paired Council member and stakeholder mean responses to the question were at an *Agreement Level* of 3.0 or higher. Council members and stakeholders in

both the MA and NE regions generally responded identically or similarly to the question about social science needs for fisheries management. The most visible outlier for *Agreement Level* was MA Council members (*Very important*)/MA SSC members (*Moderately important*) for *Anticipated future state and federal funding to support EBFM* (2.75) (Tables 13 and 14).

The social science needs option to receive the most ratings by Council members and stakeholders as *Very important* was *Social, economic, and cultural impact of fisheries management on coastal communities.* Council member and stakeholder responses regarding social science needs for fisheries management are summarized below.

NE and MA stakeholders and Council members think that each of the following is a *Very important* or *Moderately important* social science need to support fisheries management decisions: *Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability*; *Social, economic, and cultural impact of fisheries management on coastal communities*; *Consumer support and market demand for sustainable seafood*; *Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices*; *Predicted regulation and quota changes to commercial fisheries under EBFM; Anticipated future political support for EBFM*; *Anticipated future state and federal funding to support EBFM*; *Willingness of commercial fishermen to modify fishing practices*; and *Willingness of recreational fishermen to modify fishing practices*.

NE and MA stakeholders and Council members believe the following is a *Very important*, *Moderately important* or *Slightly important* social science need to support fisheries management decisions: *Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries* (Tables 13 and 14).

These results suggest that in both regions Council members and stakeholders often have

the same perspectives about social science needs for fisheries management and that in both regions Council members and stakeholders most often answer that the social science needs listed as variables under the survey question are *Very important* or *Moderately important*. The only social science need listed as *Slightly important* was NE Council members' response for the variable *Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries* (Tables 13 and 14).

Accuracy:

Accuracy Levels are relatively high for both MA (Figure 3c) and NE (Figure 3d) Council member responses for the question: *How important do YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic or New England region think the following types of social science information are to support informed decisions for federally-managed fisheries in the Mid-Atlantic or New England?* (Survey documents, Appendices H, I, J, and K). Council members generally predicted stakeholder responses to the question with an *Accuracy Level* of 3.0 or higher, suggesting that Council members in both the MA and NE regions correctly predicted or closely predicted stakeholder responses about social science needs for fisheries management (Tables 13 and 14).

The exceptions included: NE Council member prediction (*Slightly important*) of NE recreational angler response (*Very important*) about *Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries*; NE Council member prediction (*Slightly important*) of NE commercial fishermen response (*Very important*) about *Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices*; NE Council member prediction (*Slightly important*) of NE recreational angler response (*Very important*) about *Improved*

understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practice; and MA Council member prediction (*Slightly important*) of MA commercial fishermen response (*Very important*) about *Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices* (Tables 13 and 14).

These results suggest that both NE and MA Council members underestimated the importance that fishermen place on the role of the *Magnuson-Stevens Fishery Conservation and Management Act* regarding the implementation of EBFM.

Congruency:

Congruency Levels were relatively high between both MA and NE Council member responses and Council member predictions for the question about social science needs for fisheries management with almost all comparison pairs having a *Congruency Level* of 3.0 or higher (0 = no *Congruency* and 4 = perfect *Congruency*). The rare exceptions were that Council member and NGO leader pairs in both the NE and MA regions had *Congruency Levels* barely below 3.0 for *Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability* and Council member and NGO leader pairs in the NE region had a *Congruency Level* barely below 3.0 for *Willingness of commercial fishermen to modify fishing practices*. All Council member responses and Council member predictions of stakeholder responses were either the same or similar (Tables 13 and 14) suggesting that Council members in both the MA and NE regions predicted stakeholders would hold similar views to themselves regarding social science needs for fisheries management.

Table 13. Mean responses (with Standard Error) to the question "How important do YOU think the following types of social science information are to support informed decisions for federally-managed fisheries in the New England region?" Response categories ranged from Extremely important (1) to Not important (5). Definitions for the group labels are: NE_MEM is NE Council members; NE_CF is NE commercial fishermen; NE_RA is NE recreational anglers; NE_SSC is NE SSC members; NE_NGO is NE NGO leaders; NEM_CF is NE Council member prediction for NE commercial fishermen; NEM_RA is NE Council member prediction for NE recreational anglers; NEM_SSC is NE Council member prediction for NE SSC members; and NEM_NGO is NE Council member prediction for NE NGO leaders.

VARIABLE	NE_ MEM	NE_ CF	NE_ RA	NE_ SSC	NE_ NGO	NEM_ CF	NEM_ RA	NEM_ SSC	NEM_ NGO
Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability.	1.93 (.30)	1.69 (.08)	2.01 (.09)	1.83 (.46)	2.05 (.18)	1.46 (.31)	1.77 (.31)	2.77 (.31)	3.00 (.31)
Social, economic, and cultural impact of fisheries management on coastal communities.	2.14 (.30)	1.74 (.08)	2.13 (.09)	1.83 (.46)	2.10 (.18)	1.77 (.31)	2.23 (.31)	2.92 (.31)	3.00 (.31)
Consumer support and market demand for sustainable seafood.	2.79 (.30)	2.10 (.08)	2.13 (.09)	2.17 (.46)	2.69 (.18)	2.46 (.31)	3.08 (.31)	3.18 (.34)	2.67 (.32)
Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries. This is independent of whether or not the stakeholders fish or eat fish.	3.50 (.30)	2.56 (.09)	2.43 (.10)	3.17 (.46)	2.86 (.19)	3.77 (.31)	3.85 (.31)	3.33 (.32)	2.50 (.32)

Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices.	3.08 (.31)	2.34 (.09)	2.23 (.11)	2.83 (.46)	2.42 (.19)	3.75 (.32)	3.92 (.32)	3.33 (.32)	2.67 (.32)
Predicted regulation and quota changes to commercial fisheries under EBFM.	2.25 (.32)	2.05 (.09)	2.13 (.10)	2.67 (.46)	2.34 (.18)	1.62 (.31)	2.31 (.31)	2.92 (.32)	3.15 (.31)
Anticipated future political support for EBFM.	2.73 (.34)	2.59 (.09)	2.33 (.10)	2.67 (.46)	2.50 (.19)	3.18 (.34)	3.19 (.34)	3.56 (.37)	2.55 (.34)
Anticipated future state and federal funding to support EBFM.	2.50 (.32)	2.27 (.09)	2.08 (.10)	2.50 (.46)	2.14 (.18)	2.67 (.32)	2.83 (.32)	2.77 (.31)	2.31 (.31)
Willingness of commercial fishermen to modify fishing practices.	2.00 (.32)	2.18 (.08)	1.82 (.09)	2.33 (.46)	2.26 (.18)	2.39 (.31)	2.62 (.31)	3.00 (.32)	3.08 (.31)
Willingness of recreational fishermen to modify fishing practices.	2.42 (.32)	2.30 (.08)	2.23 (.09)	2.50 (.46)	2.66 (.18)	2.77 (.31)	2.31 (.31)	3.17 (.32)	3.31 (.31)

Table 14. Mean responses (with Standard Error) to the question "How important do YOU think the following types of social science information are to support informed decisions for federally-managed fisheries in the Mid-Atlantic region?" Response categories ranged from Extremely important (1) to Not important (5). Definitions for the group labels are: MA_MEM is MA Council members; MA _CF is MA commercial fishermen; MA _RA is MA recreational anglers; MA _SSC is MA SSC members; MA _NGO is MA NGO leaders; MAM_CF is MA Council member prediction for MA commercial fishermen; MAM_RA is MA Council member prediction for MA recreational anglers; MAM_SSC is MA Council member prediction for MA SSC members; and MAM_NGO is MA Council member prediction for MA NGO leaders.

VARIABLE	MA_ MEM	MA_ CF	MA_ RA	MA_ SSC	MA_ NGO	MAM_ CF	MAM_ RA	MAM_ SSC	MAM_ NGO
Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability.	1.91 (.24)	1.57 (.07)	1.89 (.08)	2.57 (.42)	2.53 (.29)	1.21 (.26)	1.78 (.26)	2.82 (.27)	2.94 (.28)
Social, economic, and cultural impact of fisheries management on coastal communities.	2.05 (.24)	1.71 (.07)	2.08 (.08)	2.29 (.42)	3.07 (.29)	1.32 (.26)	1.83 (.26)	2.82 (.27)	2.94 (.28)
Consumer support and market demand for sustainable seafood.	2.82 (.24)	2.02 (.07)	2.15 (.08)	3.00 (.42)	3.13 (.29)	2.17 (.26)	3.65 (.27)	3.58 (.32)	3.07 (.29)
Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries.	2.71 (.25)	2.66 (.08)	2.56 (.09)	3.43 (.42)	2.77 (.31)	3.65 (.27)	3.41 (.27)	3.19 (.28)	2.18 (.27)

This is independent of whether or not the stakeholders fish or eat fish.									
Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices.	2.76 (.25)	2.28 (.08)	2.19 (.10)	3.43 (.42)	2.75 (.32)	3.50 (.28)	3.33 (.29)	3.07 (.30)	2.47 (.29)
Predicted regulation and quota changes to commercial fisheries under EBFM.	2.37 (.26)	1.84 (.08)	2.11 (.09)	3.00 (.50)	3.08 (.32)	1.39 (.26)	2.28 (.26)	2.94 (.27)	2.94 (.27)
Anticipated future political support for EBFM.	2.44 (.26)	2.51 (.08)	2.31 (.09)	3.43 (.42)	3.00 (.31)	2.72 (.26)	2.94 (.27)	3.27 (.29)	2.29 (.27)
Anticipated future state and federal funding to support EBFM.	1.90 (.26)	2.35 (.08)	2.03 (.09)	3.14 (.42)	2.46 (.31)	2.33 (.26)	2.47 (.27)	2.50 (.28)	2.24 (.27)
Willingness of commercial fishermen to modify fishing practices.	2.17 (.26)	1.92 (.07)	1.76 (.08)	2.57 (.42)	2.86 (.30)	2.17 (.26)	2.59 (.27)	2.81 (.28)	2.65 (.27)

Willingness of recreational fishermen to modify fishing practices.	2.28 (.26)	2.16 (.07)	2.36 (.08)	2.43 (.42)	2.93 (.30)	2.53 (.27)	2.44 (.26)	3.00 (.28)	2.82 (.27)

3.6. Conclusion

Ideally, if Council members represent their constituents, they would understand the views of the stakeholders they represent regarding Council issues. Council members would then vote on Council issues with their constituents' interests informing member votes. In order for Council members to understand their constituents' opinions on issues, there must be some degree of understanding between Council members and stakeholders. Lack of mutual understanding between Council-related stakeholders could be a barrier to EBFM. The *Coorientation Model* provides a framework to characterize understanding between groups (Leong et al., 2008). In the context of this study, the *Coorientation Model* was used to measure the degree of understanding between Council members and stakeholders, including SSC members (Leong et al., 2008).

Council members and stakeholders in the NE and MA regions generally agreed regarding factors that could be potential barriers to the implementation of EBFM and about needs for social science information to support fisheries management decisions. For the survey questions about barriers to EBFM and social science needs for EBFM, Council members usually correctly predicted or closely predicted stakeholder responses. Additionally, Council members generally predicted that stakeholders would respond to survey questions the same or similarly as Council members responded about barriers to EBFM and social science needs for fisheries management. These findings suggest that Council members and stakeholders agree about the barriers to EBFM and the social science needs for fisheries management and that Council members accurately predict stakeholder perspectives about these issues. Additionally, Council members either

understand and agree with their constituents' attitudes toward EBFM about these issues or expect that their constituents agree with their own views.

Regarding potential barriers to EBFM, Council members and stakeholders labeled potential barriers mostly as moderate or significant, labeling many fewer as minor, and none as insurmountable. These findings suggest that although Council members and stakeholders perceive that barriers to EBFM are serious, these barriers could be surpassed. With respect to Council members' ability to predict stakeholders' perceptions about potential barriers, both NE and MA Council members repeatedly underestimated SSC member perception of the difficulty of overcoming some barriers, including increases in administrative requirements, decreases in profits, increases in fishing regulation complexity, and lower fish quotas.

Regarding the importance of social science information needs for fisheries management, Council members and stakeholders rated social science needs as *Very important* or *Moderately important*. No social science needs were labeled as *Extremely important* or *Slightly important*. These results suggest that there are needs for social science information in fisheries management, but that stakeholders do not feel the needs for social science information listed in the survey were necessary enough to be designated as *Extremely important*.

NE Council members underestimate the importance NE commercial and NE recreational fishermen and MA Council members underestimate the importance MA commercial fishermen attribute to the importance of understanding how the *Magnuson-Stevens Fishery Conservation and Management Act* supports EBFM. The role of the *Magnuson-Stevens Fishery Conservation and Management Act* in the implementation of EBFM was a consistent factor for Council members and stakeholders, both regarding barriers to and social science needs for EBFM. The reauthorization of the *Magnuson-Stevens Fishery Conservation and Management Act* was due in 2013 (NMFS, 2014) but has not yet been finalized. Whether or not the reauthorization contains

specific language about EBFM could impact the future of EBFM in fisheries management. The perception by stakeholders that the MSFCMA is a significant influence on the implementation of EBFM is supported by previous research (Biedron, 2014).

An additional exception for high *Accuracy Level* for social science needs was that NE Council members underestimated the importance that NE recreational anglers attributed to the *Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries.* NE recreational anglers assigned this inherent value more importance than Council members predicted. Although the survey focused mostly on factors with practical applications to fisheries management, the response to this question suggests that perhaps inherent values related to fisheries management play a role in perceptions of EBFM and should be considered.

Overall, the Council members and stakeholders responded that there were moderate and significant barriers to implementing EBFM and very important and moderately important social science needs for fisheries management. The study also highlights specific barriers and social science needs that managers could focus on to further the implementation of EBFM. However, neither lack of agreement between Council members and stakeholders nor lack of Council member understanding of stakeholder perceptions appeared to be an obstacle for Council transition to EBFM. These findings suggest that although Council members and stakeholders perceive major challenges to EBFM, Council members and stakeholders do not perceive that any of these challenges are insurmountable. These results may demonstrate that work is needed to reduce the barriers to EBFM and to increase social science information for fisheries management but also that the practice of EBFM is possible, with no immutable obstacles preventing its implementation.

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CHAPTER 6

ECOSYSTEM-BASED FISHERIES MANAGEMENT IN NEW ENGLAND AND THE MID-ATLANTIC: STAKEHOLDER RECOMMENDATIONS, IMPLICATIONS FOR MANAGEMENT, AND FUTURE RESEARCH

1. Introduction

The purpose of the research conducted for this dissertation was to identify factors influencing the Mid-Atlantic Fishery Management Council (MAFMC) and the New England Fishery Management Council's (NEFMC) adoption of ecosystem-based fisheries management (EBFM). Additionally, the study explored the degree of understanding about EBFM between Council decision makers and stakeholders. The insights and results discovered during this study are summarized in this chapter, with implications for future research and management.

2. Theoretical models

2.1. Coorientation Model

We used the *Coorientation Model* and the *Planning Table* to guide inquiry on our research objectives. The *Coorientation Model* (Figure 1, Chapter 1) was used to measure the degree of understanding (agreement, accuracy, and congruency) between Council members and stakeholders. We defined *Agreement* as "the extent to which the Council members and stakeholders hold the same attitudes and beliefs;" *Accuracy* as "the extent to which Council members' predictions of stakeholder attitudes and beliefs is similar to the stakeholders' actual attitudes and beliefs:" and *Congruency* as "the extent to which the Council members' predictions of stakeholder attitudes and beliefs is similar to their own" (Leong, McComas, & Decker, 2008). Council decision makers could use the information learned from this study about

levels of agreement and accuracy between stakeholders and themselves to inform future decisions about which topics related to EBFM communication between Council members and stakeholders could be improved on.

Ideally, since Council members are responsible for representing the constituents of the states in the region over which the Council has authority (Commerce, 2007), members should understand the views of the stakeholders they represent regarding Council issues. Council members would then vote on Council issues with their constituents' interests informing their votes. In order for Council members to understand their constituents' opinions on issues, there must be some degree of understanding between Council members and stakeholders. Therefore, if Council members are making decisions about EBFM as part of their Council work, lack of understanding between Council members and Council-related stakeholders could be a barrier to EBFM. The *Coorientation Model* provides a framework to characterize understanding between groups (Leong et al., 2008). In the context of this study, the *Coorientation Model* was used to measure the degree of understanding between Council members and stakeholders, including Scientific and Statistical Committee (SSC) members, about EBFM.

2.2. Planning Table

The concept of the *Planning Table* addressed whose interests are voiced, acknowledged, and incorporated into planning decisions (Cervero & Wilson, 2006). In the *Planning Table* context, interests are described as "predispositions, embracing goals, values, desires, and other orientations and inclinations that lead a person to act in one direction or another" (Morgan, 1997) and "the motivations and purposes that lead people to act in certain ways when confronted with situations in which they must make a judgment about what to do or say" (Cervero & Wilson, 2006). The component of the *Planning Table*, "Who is at the table?" is one of the theory's main themes, referring to who has "a seat at the table" (Cervero & Wilson, 2006). By exploring this

tenet of the *Planning Table* concept, the study provided information about the individuals who influence the MAFMC and NEMFC processes. "Who is at the table?" is one of the theory's main themes, referring to who has the political, financial, informational, historical, and/or cultural means to gain access to the policy discussion, or "a seat at the table"(Cervero & Wilson, 2006). **"**Who benefits?**"** is another of the theory's main themes, addressing whether the individual or group represented at the table has the power to gain traction and prioritization of her/his interests, or whether those who gain access to the table have a voice in the decision making process once seated at the table (Cervero & Wilson, 2006). "What for?" is a third tenet of the *Planning Table* theory, seeking explanations for why some interests are acknowledged in final management decisions while others are not pursued by the organization.

2.3. Theoretical Synthesis

The high levels of agreement and accuracy (Biedron, 2014b, 2014c) between Council members and stakeholders (including SSC members) suggested that Council members, those "who are at the table" making decisions about EBFM, may be effective representatives for the stakeholders. High agreement means that Council members and stakeholders responded similarly about their beliefs related to EBFM. High accuracy means that Council members usually correctly predicted stakeholder perspectives about EBFM. Since both agreement and accuracy between Council members and stakeholders are high, it is likely that Council members' votes will be representative of stakeholder beliefs. In other words, if Council members accurately predict stakeholder perspectives about EBFM, then it is likely that Council members will reflect stakeholder views in management decisions. However, if Council members do not accurately predict stakeholder attitudes, and especially if Council members and stakeholders were not in agreement about EBFM, then it would be unlikely that stakeholder views would be reflected in Council member deliberations. High accuracy, and especially high agreement,

suggests that Council members will represent stakeholder interests at the table. If accuracy were low, but agreement still high, it is possible that Council member management decisions might reflect stakeholder decisions. However, if accuracy and agreement were low, it would be unlikely that Council members would vote in a way that was representative of stakeholders since members would either not understand stakeholder perspectives and/or not agree with them.

Therefore, efforts should be continuously made for high accuracy to exist between the Council members and stakeholders, which may be improved through effective avenues of communication to improve understanding. The transition to EBFM from single-species fisheries management (SSFM) will require greater cooperation, and understanding of how perceptions differ between stakeholders will be increasingly important to maximize collaboration and minimize conflicts (Connelly & Knuth, 2002; Freemuth, 1996; Sample, 1994). The results from applying the *Coorientation Model* to the study, which could help Council members to understand their stakeholders' perceptions related to EBFM, are important for the Council decision makers to support collaboration and understand the basis for conflicts in fisheries management. The insights gained from applying the *Planning Table* demonstrate how understanding between Council decision makers and stakeholders influences decisions made by the Councils. The application of the *Planning Table* and the *Coorientation Model* theories to EBFM and the fishery management councils provided insights into how an improved understanding of the attitudes, beliefs, and communication of Council members, SSC members, and stakeholder groups could potentially help overcome barriers and facilitate the implementation of EBFM.

3. Methods

We observed Council meetings and interviewed 66 individuals, including Council members, Council staff members, and Scientific and Statistical Committee (SSC) members in the New England (NE) and Mid-Atlantic (MA) regions, about EBFM. Additionally, we sent surveys

to more than 5,600 commercial fishermen, recreational anglers, NGO leaders, SSC members and MAFMC and NEFMC members in the NE and MA regions about EBFM and received over 1,000 responses. We explored the extent to which Council members and stakeholders agreed about EBFM topics, how well the Council members predicted stakeholder responses, and how similar Council member predictions for stakeholders were to their own responses.

4. Research objectives

The purpose of our study was to improve understanding of factors contributing to or preventing progress on EBFM implementation in the MAFMC and NEFMC, focusing on Council member and stakeholder beliefs, attitudes, and understanding. To do so, we collected interview and survey data from Council members, Council staff members, SSC members, commercial fishermen, recreational anglers, and non-governmental organization (NGO) leaders about their perspectives regarding EBFM. In the surveys and/or the interviews, we asked: *How do you define EBFM? What practices do you think should be included in EBFM? What are your preferred outcomes (time lines) for EBFM? What are the potential barriers to EBFM? What are the social science needs for EBFM?* and *What are your recommendations for transitioning from SSFM to EBFM?* In the tables below, we listed the most strongly supported and/or the most popular answers to the interview and survey questions asked during the study.

5. Summary of results and stakeholder recommendations

5.1. Survey, interview, and meeting observation results

From the survey data, we found that there was relatively high agreement, accuracy, and congruency between Council decision makers and stakeholders in both the NE and MA regions for topics related to EBFM (Biedron, 2014a, 2014b, 2014c). The high agreement, accuracy, and congruency means that for both the NE and MA regions: decision makers and stakeholders responded the same or similarly to survey questions about EBFM; decision makers usually

correctly predicted or nearly correctly predicted stakeholder responses to survey questions; and decision makers usually responded similarly or the same as the answers they predicted for stakeholders. Lack of agreement or understanding between Council members and stakeholders did not appear to be a barrier to MA or NE Council transition from SSFM to EBFM. Since it appears that, at least for the MA and NE regions, most stakeholders generally agreed about definitions, practices, and outcomes for EBFM, the challenge to transitioning to EBFM will be to address other perceived barriers to EBFM.

Stakeholder "interests" regarding EBFM observed during meeting observations and interviews were grouped into four categories, the same categories the interview responses were grouped into: *science*, *human dimensions*, *policy*, and *practice*. Overall the study demonstrated that these interests influence Council transition to EBFM, both pertaining to overcoming barriers to and developing implementation plans for EBFM.

The study highlights specific barriers, social science needs, time lines and recommendations that MAFMC and NEFMC decision makers could focus on to facilitate the transition to EBFM from SSFM. Below, the findings from meeting observations, interviews, and survey responses about definitions, practices, time lines, potential barriers, social science needs, and recommendations pertaining to EBFM are presented and discussed.

5.2. Defining EBFM

The top survey results collected in response to the question *How do you define EBFM?* are summarized in Table 15. The order of responses is not significant.

Table 15. New England and Mid-Atlantic stakeholders and Council members ***Strongly Agreed*** or ***Agreed*** that the definition of Ecosystem-Based Fisheries Management (EBFM) should include the concepts listed.

Considering the interactions between the physical, biological, and human factors that affect the health of fisheries
Protecting and/or enhancing habitat
Monitoring and enforcing EBFM
Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries
Adapting to changing biological and social conditions
Incorporating geographically-specific management needs
Including flexibility into management strategies
Considering many ecological factors
Engaging stakeholders
Accounting for uncertainty in ecosystems
Addressing human needs, including those of fishermen and fishing communities

Council members and stakeholders in the NE and MA regions generally agreed regarding concepts that should be included in the definition of EBFM. These findings demonstrate that Council members and stakeholders define EBFM as a holistic approach to management. These perspectives parallel the definitions experts use to describe EBFM (Essington & Punt, 2011; Francis, Hixon, Clarke, Murawski, & Ralston, 2007; Levin, Fogarty, Murawski, & Fluharty, 2009).

5.3. Management practices

The top survey results collected in response to the question *What practices do you think should be included in EBFM?* are summarized in Table 16. The order of responses is not significant.

Table 16. New England and Mid-Atlantic stakeholders and Council members responded that it was *Extremely important*, *Very important* or *Moderately important* that the following practices be implemented as part of fisheries management by the Mid-Atlantic (MAFMC) and/or New England Fishery Management Council (NEFMC) over the next 10 years.

Continuing inclusion of stakeholders on the MAFMC/NEFMC Advisory Panel for ecosystem-based fisheries management (EBFM)
Establishing a specific operational plan for incorporating ecosystem considerations into MAFMC/NEFMC decision making
Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions
Rewriting the MAFMC/NEFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate EBFM principles
Incorporating the EBFM approach into MAFMC/NEFMC priorities
Integrating social, economic, and community impact analyses into the MAFMC/NEFMC decision making processes

These results suggest that Council members and stakeholders often have the same perspectives about practices that should be implemented in fisheries management in the NE and MA regions over the next 10 years. These findings demonstrate that Council members and stakeholders support practices that are thought to be central to EBFM (Essington & Punt, 2011; Francis et al., 2007; Levin et al., 2009).

5.4. Management outcomes

The top survey results collected in response to the question *What are your preferred outcomes (time lines) for EBFM?* are summarized in Table 17. The order of responses is not significant.

Table 17. New England and Mid-Atlantic stakeholders and Council members *Moderately supported* or were *Neutral* to each one of the following options as a desired outcome for fisheries management in the New England and/or Mid-Atlantic Fishery Management Council over the next 10 years.

Incremental change from single species fisheries management (SSFM) to ecosystem-based fisheries management (EBFM)
An intermediate change from SSFM to EBFM

The study suggests that most Council members and stakeholders in the MA and NE regions want a change from SSFM to EBFM at an incremental, intermediate, or complete, gradual (5-10 years) pace. These results suggest that Council members and stakeholders do want to begin transitioning to EBFM, either partially or fully, but that they want the evolution to be slow. Council members and stakeholders in both regions showed the least support for management options for no change from current SSFM and for complete immediate change (0-4 years) to EBFM, the extreme ends of the management spectrum. Overall, Council members and stakeholders overwhelmingly supported some level of transition from SSFM to EBFM, which may take acceptance of some uncertainty and patience as the transition to EBFM takes on momentum and is adapted to fulfill management needs.

5.5. Barriers to EBFM

The top survey results collected in response to the question *What are the potential barriers to EBFM?* are summarized in Table 18. The order of responses is not significant.

Table 18. New England and Mid-Atlantic stakeholders and Council members think that each of the following is a *Moderate* or *Significant* barrier to implementing EBFM.

Insufficient scientific data to support the transition to EBFM
There are so many variables that must be considered
Council structure is currently organized to deal with individual fishery management plans
Lack of science to support EBFM plans
Lack of definitive, achievable action plan for EBFM
Lack of funding
Lack of reliable fish population models based on ecosystem-based principles
Lack of political support
Concern about lower fishing quotas
Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management
Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management
Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management

Overall in survey responses, the Council members and stakeholders responded that there were moderate and significant barriers to implementing EBFM. Additionally, we observed Council meetings and interviewed 66 individuals, including Council members, Council staff members, and SSC members in the NE and MA regions, about EBFM (Biedron, 2014a) to explore what Council participants perceived as potential barriers to EBFM. Interviewees, NEFMC and MAFMC members, staff members, and SSC members, identified 29 barriers to EBFM. The top 10 barriers, ranked by overall number of interviewees who mentioned them, are listed in Table 19.

Table 19. The top 10 potential barriers to ecosystem-based fisheries management (EBFM) in rank by the number of interviewees who mentioned them at least once.

Rank	Barriers
1	Lack of science, data, and modelling capability
2	EBFM is constrained by the Magnuson-Stevens Fishery Conservation and Management Act; EBFM is not legally mandated
3	Need socioeconomic information
4	Lack of funding for EBFM
5	Governance
6	Lack of goals and an implementation plan for EBFM
7	Lack of stakeholder engagement
8	Reluctance to change
9	Lack of universally accepted definition of EBFM
10	Lack of stakeholder buy-in

Lack of science, data, and modelling capability was identified as a barrier by the highest number of interviewees (Biedron, 2014a). The perceived barrier *Lack of science, data, and modelling capability* suggests that there is a lack of scientific information about EBFM being conveyed to Council members, staff members, and SSC members, which may indicate that more scientists with expertise in EBFM should be included in Council decision-making processes (i.e. as voting Council members or SSC members). Additionally, perhaps increased communication between scientists from the Northeast Fisheries Science Center (NEFSC) and the SSCs and Council members is needed. The SSC Chairman attends and reports at all MAFMC meetings. This practice is credited with improving communication and understanding of science related to Council business and relations between the MAFMC and SSC (Biedron, 2014a). If the NEFMC chose to adopt this practice, understanding and communication of science may improve between NEFMC members and the SSC. Finally, some members of the SSC have ideas for research that could be useful to the Councils, but some frustration was expressed by SSC members that although the Councils may be open to this research if it were proposed, the Council members are

not aware of the need and therefore do not request that the studies to be completed by the SSC. This communication weakness may suggest that the Councils create a process by which they solicit ideas about potential research from the SSC for consideration by the Council.

The MSFCMA was an influential factor regarding implementation of EBFM. The study suggests that the MSFCMA and the *National Standards* included in the MSFCMA (Commerce, 2007) play a large role in which groups' interests are addressed in final management decisions. The results suggest that both NE and MA Council members underestimated the importance that fishermen place on the role of the MSFCMA regarding the implementation of EBFM. The MSFCMA was due for reauthorization in 2013 but reauthorization has not yet been completed. Under the current version of the MSFCMA many interviewees perceived that the Councils are under threat of litigation if they practice EBFM; however, if the reauthorization contains language that more specifically mandates EBFM, these interviewees believed that Councils will experience more legal pressure and less legal uncertainty toward transitioning to EBFM.

With respect to Council members' ability to predict stakeholders' perceptions about potential barriers to EBFM, both NE and MA Council members repeatedly underestimated SSC member perception of the difficulty of overcoming some barriers, including increases in administrative requirements, decreases in profits, increases in fishing regulation complexity, and lower catch quotas.

The barrier *Lack of universally accepted definition of EBFM* was mentioned by the majority of MA Staff members. One concern of interviewees is that people may have differing opinions about how EBFM is defined. The reason this could be a problem is that while many stakeholders support EBFM in theory, once the specifics of an EBFM plan are outlined, there may be more disagreement about the implementation of EBFM.

The barrier *Lack of stakeholder by-in* was mentioned by the majority of MA SSC members. There was concern from some interviewees that if stakeholders did not perceive a benefit to EBFM then there would not be an incentive to support it. For stakeholders to learn about how EBFM would affect the specifics of fisheries regulation, the NEFMC, the MAFMC and the NEFSC would need to do more educational outreach about EBFM.

These results suggest that Council members and stakeholders perceive that there are many significant, moderate, and/or minor potential barriers to the implementation of EBFM, but no potential barriers that are not a barrier and no insurmountable barriers. These results may demonstrate that work is needed to reduce the barriers to EBFM but also that the practice of EBFM is possible, with no permanent obstacles blocking its implementation.

5.6. Social science needs

The top survey results collected in response to the question *What are the social science needs for EBFM?* are summarized in Table 20. The order of responses is not significant.

Table 20. New England and Mid-Atlantic stakeholders and Council members think that each of the following is a *Very important* or *Moderately important* social science need to support fisheries management decisions

Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability
Social, economic, and cultural impact of fisheries management on coastal communities
Consumer support and market demand for sustainable seafood
Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management (EBFM) practices
Predicted regulation and quota changes to commercial fisheries under EBFM
Anticipated future political support for EBFM
Anticipated future state and federal funding to support EBFM
Willingness of commercial fishermen to modify fishing practices
Willingness of recreational fishermen to modify fishing practices

These results suggest that there are needs for social science information in fisheries

management, but that stakeholders do not feel the needs for social science information listed in the survey were necessary enough to be designated as *Extremely important*. The role of the MSFCMA in the implementation of EBFM was a consistent factor for Council members and stakeholders regarding social science needs for EBFM.

It seems that there is not clear access or representation for social science needs related to human dimensions. A handful of SSC members are experts in human dimensions and/or social science and can provide their input via SSC recommendations. Some human dimensions input comes from social scientists or economists on Council-affiliated committees, plan development teams, and advisory panels or from experts asked to present data at meetings. Council staff members often include information about human dimensions in reports and materials given to Council members but this information may be lost in the large amount of information given to Council members to review. Based on interviews, it seemed that there are no or very few Council members with expertise in human dimensions. There is a Social Sciences Branch at the NEFSC, but it seems that direct communication with the Social Sciences Branch is lacking. Power to influence Council decisions about human dimensions may increase if reports or studies with specific numbers about numbers of jobs or income that were or would be lost due to a change in a specific fishery management plan were available, but such studies seem scarce and some social scientists interviewed suggested that the data required for these studies is unavailable (Biedron, 2014a). Additionally, Council members and staff have the power to increase consideration of human dimensions in EBFM by prioritizing inclusion of human dimensions in Council discussions.

5.7. Recommendations for NEMFC/MAFMC transition to EBFM

We observed Council meetings and interviewed 66 individuals, including Council members, Council staff members, and SSC members in the NE and MA regions, about EBFM.

We solicited recommendations regarding the implementation of EBFM from Council participants. Interviewees, NEFMC and MAFMC members, staff members, and SSC members, suggested 14 recommendations for approaching implementation challenges to EBFM (Biedron, 2014a). The top 10 recommendations, ranked by overall number of interviewees who mentioned them, are listed in Table 21.

Table 21. The top 10 recommendations for transitioning to ecosystem-based fisheries management (EBFM) in rank by number of interviewees who mentioned them at least once.

Rank	Recommendations
1	Define EBFM, identify objectives, and determine specific plan and time line for implementation
2	Transition to EBFM incrementally
3	Implement EBFM on an experimental or pilot study scale, observe outcomes, and adapt management as necessary
4	Develop buy-in with all stakeholders about EBFM
5	Practice EBFM based on spatial management (ecosystem production units)
6	The fishery management councils and leaders should look to the SSC and the science center for science and models that would support EBFM
7	Consider removals based on a biomass cap
8	Increase understanding of ecosystems to prepare for long-term ecosystem changes
9	Practice EBFM as supported by some Magnuson-Stevens Fishery Conservation and Management Act National Standards
10	Evaluate tradeoffs of EBFM plans

The recommendation *Define EBFM, identify objectives, and determine specific plan and time line for implementation* was cited by the highest number of interviewees, which expressed a desire for more specifics regarding EBFM. There was general concern that EBFM is too vague and could be interpreted in a variety of ways depending on the interests of the user group. Interviewees suggested a variety of objectives or plans for implementation of EBFM, including developing terms of reference for the SSC regarding EBFM and creating Council subcommittees, plan development teams, and advisory panels for EBFM.

The recommendation *Transition to EBFM incrementally* reflected the high level of support for an incremental transition to EBFM by interviewees. This support of an incremental transition to EBFM was also expressed by the commercial and recreational fishermen, non-governmental organization leaders, Council members, and SSC members (Biedron, 2014b, 2014c).

The recommendation *Implement EBFM on an experimental or pilot study scale, observe outcomes, and adapt management as necessary* highlighted a common response heard during the study, which is that in order for the Council to implement EBFM on a regional scale, it would be helpful to first try EBFM on a smaller scale or experimental basis, and then adapt or modify the EBFM plan as needed to correct for unanticipated problems and to improve the plan based on observations of the pilot EBFM study.

5.8. Summary conclusion

Neither low agreement nor low understanding between Council members and stakeholders appears to be a barrier to NEFMC or MAFMC transition from SSFM to EBFM. Overall, managers and stakeholders in both the NE and MA regions generally agreed that EBFM is a holistic approach to fisheries management which includes biological, environmental, and human factors, and that the Councils should gradually transition to a management plan that reflects EBFM. Council members and stakeholders responded that there are needs for social science information for EBFM and that although Council members and stakeholders perceive major barriers to EBFM, Council members and stakeholders do not perceive that these challenges are insurmountable. Other factors that may influence the pace at which the transition occurs are lack of direction, momentum, and understanding of how to initiate and complete the transition, lack of resources, or lack of political will (Biedron, 2014a; Link, 2010; K. L. McLeod & Leslie, 2009; PFMC, 2013; SSC, 2010). Managers and stakeholders suggest a variety of

recommendations in the interests of science, human dimensions, policy, and practice to implement EBFM in the NE and MA regions. Once the specifics of EBFM time lines, science, and quotas are discussed, manager and stakeholder opinions diverge, but overall there is agreement between Council decision makers and stakeholders in the NE and MA regions about what EBFM is and if it should be done.

6. Implications for management

The application of the *Planning Table* and the *Coorientation Model* theories to EBFM and the fishery management councils provided insights into how an improved understanding of the attitudes, beliefs, and communication of Council members, SSC members, and stakeholder groups could potentially help overcome barriers and facilitate the implementation of EBFM. The information reported by the study highlights EBFM topic areas that are important to Council decision-makers and stakeholder groups and in which communication, discussion, and combined action between Council decision makers and stakeholder groups could increase the effectiveness and efficiency of implementing EBFM in the NE and MA regions. This document provides feedback from a representative selection of NEFMC and MAFMC stakeholders about the transition to EBFM, including how to define EBFM, how to practice EBFM, preferred time lines for transition to EBFM, potential barriers to EBFM, social science needs for EBFM, and recommendations for implementing EBFM. This feedback could be incorporated into NEFMC and MAFMC decisions about Council EBFM implementation plans. The study highlights specific barriers, social science needs, and recommendations for EBFM which concern stakeholders that managers could focus on to facilitate the implementation of EBFM.

A recurring theme throughout the study was that a source of conflict for EBFM is that sometimes, in the short term, what is in the best interest of humans, fishing communities, and industry is not always in the best interest of fish populations. The well-being of both humans

and fish stocks is supported by the *National Standards*, which makes prioritizing one entity's interest over the other's complicated. *National Standard #1, Prevent overfishing while achieving optimum yield* (Commerce, 2007) illustrates this tension. However, in the long term, the interests of both humans and fish stocks will be maximized by management based on the best available science and a precautionary approach, practices inherent to EBFM.

7. Suggestions for future research

One recommendation for future research builds on a recommendation suggested by interviewees (Table 21). This recommendation, "Evaluate tradeoffs of EBFM plans," recognizes that EBFM outcomes are uncertain and may or may not lead to improved outcomes in fisheries management. This recommendation suggests that managers should attempt to compare the consequences of SSFM, EBFM, and/or a plan that includes both approaches, such as an Ecosystem-Approach to Fisheries Management plan, which incorporates ecosystem principles into existing plans under SSFM (MAFMC, 2014), before deciding to implement any of them.

Additional data from this study, not included in this dissertation but that may be reported at a future date, include inquiry related to Coorientation and Council member and stakeholder surveys. Future analysis may focus on "intra-Council" understanding, including characterizing agreement, accuracy, and congruency between Council members, Council staff members, and Council SSC members. Subsequent Coorientation analysis could evaluate understanding between Council members and Priority Recreational Anglers (Council-affiliated recreational anglers) compared to understanding between Council members and non-Council affiliated recreational anglers. Evaluation of understanding between Priority Recreational Anglers and non-Council affiliated recreational anglers could also provide insight into improving Council communication processes between Council members and stakeholders.

Additional future research, also based on survey data from this study, could compare the

responses of those recreational and commercial stakeholders who identified themselves as "familiar with EBFM" to those who identified themselves as "not familiar with EBFM." Similarly, responses of those recreational and commercial stakeholders who identified themselves as "familiar with the MAFMC/NEFMC" and of those who identified themselves as "not familiar with the MAFMC/NEFMC" could be compared.

Other research which could be explored more thoroughly based on survey data collected during this study includes the effectiveness of communication about EBFM from the MAFMC and NEFMC to the public, the effectiveness of communication about EBFM from the public to the MAFMC and NEFMC, and suggestions for effective approaches to fostering communication between the MAFMC and NEFMC and the public.

Additional data from this study that may be reported at a future date includes data from interviews conducted with NEFMC and MAFMC members, staff members, and SSC members. Interview data about what criteria Council decision makers consider important when implementing EBFM could highlight aspects of EBFM for managers to focus on for management. Additionally, Council decision maker responses regarding their current avenues of communication may help establish a communication process baseline on which to compare future communication processes.

Expanding this study to include all eight U.S. fishery management councils, and possibly other entities practicing EBFM globally, and then comparing how decision maker and stakeholder perspectives are similar or different for groups conducting varying stages of EBFM, may provide information about key elements of an effective transition to EBFM.

Finally, based on many recommendations from decision makers and stakeholders during meeting observations, interviews, and survey responses, the development and implementation of a pilot plan for EBFM, which includes a time line for specific actions, reference points,

monitoring outcomes, evaluation, and adaptation as necessary, could inform and facilitate the transition of the NEFMC and the MAFMC from SSFM to EBFM on a regional scale.

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APPENDIX A

Websites and documents reviewed for the information review.

Website or Document Reviewed for Information Review	**Year**	**MAFMC**	**NEFMC**	**Document**	**Website**
Ecosystem Status Report	2009	*	*	*	
White Paper On Ecosystem-Based Fishery Management For New England Fishery Management Council	2010		*	*	
Ecosystem-based Fishery Management for the Northeast Continental Shelf	2010	*	*	*	
http://www.mafmc.org/workshop/ssc-national-workshop-4	2011	*			*
Visioning and Strategic Planning: Stakeholder Input Report	2012	*			*
Report of a National SSC Workshop on Scientific Advice on Ecosystem and Social Science Considerations in U.S. Federal Fishery Management	2012	*		*	
http://www.mafmc.org/workshop/forage-fish-workshop	2013	*			*
http://www.nefmc.org/ecosystems/index.html	2013		*		*
http://www.nefmc.org	2014		*		*

APPENDIX B

A list of the meetings and workshops attended as part of the exploratory phase of the study.

Meetings/Workshops	**Dates**	**Location**	**MAFMC**	**NEFMC**	**NOAA Fisheries**
Review of Modeling Approaches in Support of Ecosystem-Based Fishery Management	March 29-31, 2011	Northeast Fisheries Science Center, Woods Hole, MA			*
Fourth National Scientific and Statistical Committee Workshop	October 4-6, 2011	Williamsburg, VA	*		
Full Council meeting	April 12-14, 2011	Annapolis, MD	*		
Full Council meeting	June 14-16, 2011	Port Jefferson, NY	*		
Full Council meeting	August 16-18, 2011	Wilmington, DE	*		
Full Council meeting	October 11-13, 2011	Galloway, NJ	*		
Full Council meeting	December 13-15, 2011	Williamsburg, VA	*		
Full Council meeting	April 26-28, 2011	Mystic, CT		*	
Full Council meeting	June 21-23, 2011	Portland, ME		*	
Full Council meeting	September 26-29, 2011	Danvers, MA		*	
Full Council meeting	November 15-17, 2011	Newport, RI		*	

Full Council meeting	February 14-16, 2012	Virginia Beach, VA	*		
Full Council meeting	April 10-12, 2012	Duck, NC	*		
Full Council meeting	June 11-14, 2012	New York, NY	*		
Full Council meeting	August 13-16, 2012	Philadelphia, PA	*		
Full Council meeting	October 15-18, 2012	Long Branch, NJ	*		
Full Council meeting	December 10-13, 2012	Baltimore, MD	*		
Full Council meeting	January 31-February 2, 2012	Portsmouth, NH		*	
Full Council meeting	April 24-26, 2012	Mystic, CT		*	
Full Council meeting	5/1/2012	Taunton, MA		*	
Full Council meeting	June 19-21, 2012	Portland, ME		*	
Full Council meeting	September 25-27, 2012	Plymouth, MA		*	
Full Council meeting	November 13-15, 2012	Newport, RI		*	
Full Council meeting	February 12-14, 2013	Hampton, VA	*		
Full Council meeting	April 9-11, 2013	Raleigh, NC	*		
Full Council meeting	June 10-13, 2013	Eatontown, NJ	*		

Full Council meeting	August 13-15, 2013	Wilmington, DE	*		
Full Council meeting	October 7-10, 2013	Philadelphia, PA	*		
Full Council meeting	12/12/2013	Annapolis, MD	*		
Full Council meeting	January 29-31, 2013	Portsmouth, NH		*	
Full Council meeting	April 23-25, 2013	Mystic, CT		*	
Full Council meeting	June 18-20, 2013	Portland, ME		*	
Full Council meeting	September 24-26, 2013	Hyannis, MA		*	
Full Council meeting	11/20/2013	Newport, RI		*	
Full Council meeting	December 16-18, 2013	Danvers, MA		*	

APPPENDIX C

Cornell University
Office of
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Institutional Review Board for Human Participants

Concurrence of Exemption

To: Barbara Knuth
From: Matthew Aldridge, Senior IRB Administrator
Date: March 21, 2011

RE: **Protocol ID#:** 1006001489
Project(s): Human Dimensions of Natural Resource and Environmental Management Systems

A member of the Office of Research Integrity and Assurance (ORIA) has reviewed the above-referenced request for amendment and found it to continue to qualify for **Exemption from IRB Review** according to paragraph #1, 2, 3, 4 of the Department of Health and Human Services Code of Federal Regulations 45 CFR 46.101(b).

This proposal has not been evaluated for scientific merit, except to weigh the risk to the human participants in relation to the potential benefits.

Please be aware of the following:

- This exemption covers Ingrid Biedron's observation of the Mid-Atlantic and New England Fishery Management Council meetings, scientific planning/informational/policy development meetings, committee meetings, advisory panel meetings, and plan development team meetings (anticipated dates from March 29, 2011 through March 29, 2014).
- Exemption from IRB review does not absolve the investigator from ensuring that the welfare of the research subjects is protected and that methods used and information provided to gain participant consent are appropriate to the activity. It is your

responsibility as a researcher to familiarize yourself with and conduct the research in accordance with the ethical standards of the Belmont Report (http://ohsr.od.nih.gov/guidelines/belmont.html).

- You must notify the ORIA office of changes or amendments to the above-referenced protocol **BEFORE** their implementation.
- You are not required to submit progress reports or requests for continuing review/approval to ORIA, unless you modify your study protocol.

APPENDIX D

Cornell University
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Institutional Review Board for Human Participants

Concurrence of Exemption

To: Barbara Knuth
From: Matthew Aldridge, Senior IRB Administra
Date: March 06, 2012

RE: **Protocol ID#:** 1006001489
Project(s): Human Dimensions of Natural Resource and Environmental Management Systems

A member of the Office of Research Integrity and Assurance (ORIA) has reviewed the above-referenced request for amendment and found it to continue to qualify for **Exemption from IRB Review** according to paragraph #1, 2, 3, 4 of the Department of Health and Human Services Code of Federal Regulations 45 CFR 46.101(b).

This proposal has not been evaluated for scientific merit, except to weigh the risk to the human participants in relation to the potential benefits.

Please be aware of the following:

- This exemption notice covers the addition of an interview questionnaire (Factors Influencing the Transition to Ecosystem-based Fisheries Management) and related recruitment and consent materials.
- Exemption from IRB review does not absolve the investigator from ensuring that the welfare of the research subjects is protected and that methods used and information provided to gain participant consent are appropriate to the activity. It is your responsibility as a researcher to familiarize yourself with and conduct the research in accordance with the ethical standards of

the Belmont Report (http://ohsr.od.nih.gov/guidelines/belmont.html).

- You must notify the ORIA office of changes or amendments to the above-referenced protocol **BEFORE** their implementation.
- You are not required to submit progress reports or requests for continuing review/approval to ORIA, unless you modify your study protocol.

APPENDIX E

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Institutional Review Board for Human Participants

Concurrence of Exemption

To: Barbara Knuth
From: Matthew Aldridge, Senior IRB Administra
Date: November 05, 2012

RE: **Protocol ID#:** 1006001489
Project(s): Human Dimensions of Natural Resource and Environmental Management Systems

The IRB staff has reviewed the amendment request for the above-referenced protocol and found it to continue to qualify for **Exemption from IRB Review** according to paragraph #1, 2, 3, 4 of the Department of Health and Human Services Code of Federal Regulations 45 CFR 46.101(b).

This proposal has not been evaluated for scientific merit, except to weigh the risk to the human participants in relation to the potential benefits.

Please be aware of the following:

- This exemption notice covers the following amendments to the study: addition of mail surveys of commercial fishermen (n=2,666), marine recreational anglers (n=2,666), NGO environmental leaders in the New England and Mid-Atlantic regions (n~100), and New England and Mid-Atlantic Fishery Management Council members, staff, and Scientific and Statistical Committee members (n~100).
- Exemption from IRB review does not absolve the investigator from ensuring that the welfare of the research subjects is

protected and that methods used and information provided to gain participant consent are appropriate to the activity. It is your responsibility as a researcher to familiarize yourself with and conduct the research in accordance with the ethical standards of the Belmont Report (http://www.hhs.gov/ohrp/policy/belmont.html).

- You must notify the IRB office of changes or amendments to the above-referenced protocol **BEFORE** their implementation.
- You are not required to submit progress reports or requests for continuing review/approval to the IRB office, unless you modify your study protocol.

APPENDIX F

Key interview questions for MAFMC and NEFMC members, staff, and SSC members

What is your role in fisheries management?

How do you define ecosystem-based fisheries management?

What criteria are important to consider when implementing ecosystem-based fisheries management?

How do you think the Council should proceed regarding transitioning from SSFM to EBFM? What process/management approach would you recommend?

What are your current avenues of communication with stakeholders and/or Council members, staff, and Scientific and Statistical Committee members?

What types of social science data would be most helpful to the Council to overcome barriers and/or implement incentives to facilitate a successful transition to ecosystem-based fisheries management??

How similar or different do you think the transition to ecosystem-based fisheries management will be for the New England Council versus the Mid-Atlantic Council?

Are there factors that play a role in whether or not the Council transitions from SSFM to EBFM that we haven't discussed? Is there anything else that you would like to add that you think is important for me to know?

APPENDIX G

Key survey questions for MAFMC and NEFMC members, staff, and SSC members

What *concepts should be included in the definition of EBFM?*

What practices should be implemented in the NEFMC/MAFMC over the next 10 years?

What should be the desired outcomes for fisheries management in the NEFMC/MAFMC over the next 10 years?

What are barriers to Council implementation of EBFM?

What type of social science information is needed to support informed decisions for federally-managed fisheries in the New England/Mid-Atlantic region?

How could communication about EBFM between the Council and the public be improved?

Are there other factors influencing Council adoption of EBFM in addition to those mentioned already? If so, could you please describe some of them?

APPENDIX H

A Survey of Stakeholder Perspectives about Ecosystem-Based Fisheries Management and the Mid-Atlantic Fishery Management Council

Cornell University
Human Dimensions Research Unit

A Survey of
Stakeholder Perspectives About
Ecosystem-Based Fisheries Management and
the Mid-Atlantic Fishery Management Council

Research conducted by the Human Dimensions Research Unit
in the Department of Natural Resources
Cornell University

The goal of this project, conducted through Cornell University, is to improve understanding of stakeholders' views about using ecosystem-based fisheries management (EBFM) as a strategy to manage fish stocks administered by the Mid-Atlantic Fishery Management Council (MAFMC). The purpose of this questionnaire is to gain your input as a MAFMC contributor about EBFM and its relevance to the MAFMC management principles. As a participant in federally-managed marine fisheries in the Mid-Atlantic region, your input will help other fishery managers, policy-makers and researchers understand the range of perspectives and beliefs that are held by stakeholders about EBFM and will inform ongoing management decisions today and in the future.

Please complete this questionnaire as soon as you can, seal it with the white resealable label provided, and drop it in any mailbox; return postage has been paid. Your participation in this survey is voluntary, but we hope that you will take a few minutes to help and contribute your experiences and opinions. Your identity will be kept confidential and the information you give us will never be associated with your name. Thank you for taking the time to participate in this survey.

THANK YOU FOR YOUR HELP!

1. **In addition to your role as a Mid-Atlantic Fishery Management Council member, staff member, or Scientific and Statistical Committee member, how would you describe your participation in federally-managed marine fisheries in the Mid-Atlantic region? (***Please check all that apply.)*

- ☐ Currently permitted commercial fisheries boat operator
- ☐ Marine recreational fisherman
- ☐ Currently permitted commercial fisheries boat owner
- ☐ Crew member on a commercial fishing boat
- ☐ A member of or staff for a nongovernmental organization related to fisheries
- ☐ Charter boat operator
- ☐ Charter boat owner
- ☐ Currently permitted commercial seafood dealer
- ☐ None of the above
- ☐ Other - Please list: _____

2. **Are you familiar with the term "ecosystem-based fisheries management (EBFM)"?**
   Whatever your answer is to "Question 2," please continue answering the questionnaire after completing this question.

- ☐ Not familiar at all
- ☐ Slightly familiar
- ☐ Moderately familiar
- ☐ Very familiar

3. Please indicate to what extent YOU agree or disagree that the definition of "ecosystem-based fisheries management (EBFM)" should include the following concepts? *(Please check one box for each statement.)*

The definition should include:	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
Considering the interactions between the physical, biological, and human factors that affect the health of fisheries.	☐	☐	☐	☐	☐	☐
Protecting and/or enhancing habitat.	☐	☐	☐	☐	☐	☐
Monitoring and enforcing EBFM.	☐	☐	☐	☐	☐	☐
Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries.	☐	☐	☐	☐	☐	☐
Developing stakeholder buy-in.	☐	☐	☐	☐	☐	☐
Adapting to changing biological and social conditions.	☐	☐	☐	☐	☐	☐
Incorporating geographically-specific management needs.	☐	☐	☐	☐	☐	☐
Including flexibility into management strategies.	☐	☐	☐	☐	☐	☐
Considering many ecological factors.	☐	☐	☐	☐	☐	☐
Balancing diverse social objectives.	☐	☐	☐	☐	☐	☐
Engaging stakeholders.	☐	☐	☐	☐	☐	☐
Accounting for uncertainty in ecosystems.	☐	☐	☐	☐	☐	☐
Addressing human needs, including those of fishermen and fishing communities.	☐	☐	☐	☐	☐	☐

4. Please indicate to what extent <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic Region would agree or disagree</u> that the definition of "ecosystem-based fisheries management (EBFM)" should include the following concepts. *(Please check one box for each statement.)*

The definition should include:		**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Considering the interactions between the physical, biological, and human factors that affect the health of fisheries.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Protecting and/or enhancing habitat.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Monitoring and enforcing EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐

	Environmental NGOs	☐	☐	☐	☐	☐	☐
The definition should include:		**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Developing stakeholder buy-in.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Adapting to changing biological and social conditions.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Incorporating geographically-specific management needs.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
The definition should include:		**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Including flexibility into management strategies.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Considering many ecological factors.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Balancing diverse social objectives.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐

	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Engaging stakeholders.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
The definition should include:		**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Accounting for uncertainty in ecosystems.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Addressing human needs, including those of fishermen and fishing communities.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐

	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

5. How important do <u>YOU think</u> it is that the following practices should be implemented as part of fisheries management in the Mid-Atlantic Fishery Management Council (MAFMC) over the next 10 years? *(Please check one box for each statement.)*

The following practices should be implemented as part of fisheries management:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions.	☐	☐	☐	☐	☐	☐
Establishing a specific operational plan for incorporating ecosystem considerations into MAFMC decision making.	☐	☐	☐	☐	☐	☐
Rewriting the MAFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based fisheries management (EBFM) principles.	☐	☐	☐	☐	☐	☐
Incorporating the EBFM approach into MAFMC priorities.	☐	☐	☐	☐	☐	☐
Continuing inclusion of stakeholders on the MAFMC Advisory Panel for EBFM.	☐	☐	☐	☐	☐	☐
Integrating social, economic, and	☐	☐	☐	☐	☐	☐

community impact analyses into the MAFMC decision making processes.						
Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught.	☐	☐	☐	☐	☐	☐

6. How important do <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic Region think</u> it is that the following practices should be implemented as part of fisheries management in the Mid-Atlantic Fishery Management Council (MAFMC) over the next 10 years? *(Please check one box for each statement.)*

The following practices should be implemented as part of fisheries management:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Establishing a specific operational plan for incorporating ecosystem considerations into	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐

MAFMC decision making.	**Environmental NGOs**	☐	☐	☐	☐	☐	☐

The following practices should be implemented as part of fisheries management:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Rewriting the MAFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based fisheries management (EBFM) principles.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Incorporating the EBFM approach into MAFMC priorities.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Continuing inclusion of stakeholders on the MAFMC Advisory Panel for EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
The following practices should be implemented as part of fisheries management:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Integrating social, economic, and community impact analyses into the MAFMC decision making processes.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

7. How strongly would <u>YOU support</u> each one of the following <u>options</u> as a desired outcome for fisheries management in the Mid-Atlantic Fishery Management Council (MAFMC) over the next 10 years? *(Please check one box for each statement.)*

The desired outcome for fisheries management should be:	**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
Continuation of single species fisheries management as currently practiced, treating each fishery management plan as separate and slightly incorporating ecosystem interactions, such as essential fish habitat and marine mammals.	☐	☐	☐	☐	☐	☐
Incremental change from single species fisheries management to ecosystem-based fisheries management (EBFM) in which the Council considers existing species plans in relation to the ecosystems in which they occur and begins to consider how species and fisheries covered by different plans interact through mechanisms such as by-catch, predation, forage base, etc…	☐	☐	☐	☐	☐	☐
An intermediate change from single species fisheries management to EBFM in which single species fishery management plans are replaced with a smaller number of fishery management plans that each integrate several species according to proximity of ecological regions;	☐	☐	☐	☐	☐	☐

when taken together, the multi-species fishery management plans will directly or indirectly cover all the species in the system.						
The desired outcome for fisheries management should be:	**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
A complete, gradual (5-10 years) transition from single species fisheries management to EBFM that minimizes the number of fishery management plans and that explicitly considers interactions among species and fisheries and directly accounts for the most ecological factors possible including climate, environmental effects, predation, forage base, and habitat.	☐	☐	☐	☐	☐	☐
A complete, immediate change (0-4 years) from single species fisheries management to EBFM that minimizes the number of fishery management plans and that incorporates all fisheries species and environmental factors within the ecosystem being managed.	☐	☐	☐	☐	☐	☐

8. How strongly do <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic Region would support</u> each one of the following options as a desired outcome for fisheries management in the Mid-Atlantic Fishery Management Council (MAFMC) over the next 10 years? *(Please check one box for each **statement.**)*

The desired outcome for fisheries management should be:		**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
Continuation of single species fisheries management as currently practiced, treating each fishery management plan as separate and slightly incorporating ecosystem interactions, such as essential fish habitat and marine mammals.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

The desired outcome for fisheries management should be:		**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
Incremental change from single species fisheries management to ecosystem-based fisheries management (EBFM) in which the Council considers existing species plans in relation to the ecosystems in which they	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐

occur and begins to consider how species and fisheries covered by different plans interact through mechanisms such as by-catch, predation, forage base, etc…	**Environmental NGOs**	☐	☐	☐	☐	☐	☐

The desired outcome for fisheries management should be:		**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
An intermediate change from single species fisheries management to EBFM in which single species fishery management plans are replaced with a smaller number of fishery management plans that each integrate several species according to proximity of ecological regions; when taken together, the multi-species fishery management plans will directly or indirectly cover all the species in the system.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

The desired outcome for fisheries management should be:		**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
A complete, gradual (5-10 years) transition from single species fisheries management to EBFM that minimizes the number of fishery management plans and that explicitly considers interactions among species and fisheries and directly accounts for the most ecological factors possible including climate, environmental effects, predation, forage base, and habitat.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

The desired outcome for fisheries management should be:		Strongly support	Moderately support	Neutral	Moderately oppose	Strongly oppose	Don't know
A complete, immediate change (0-4 years) from single species fisheries management to EBFM that minimizes the number of fishery management plans and that incorporates all fisheries species and environmental factors within the ecosystem being managed.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

9. How significant do <u>YOU think</u> each of the following is as a potential <u>barrier</u> to the Mid-Atlantic Fishery Management Council (MAFMC) in implementing ecosystem-based fisheries management (EBFM)? *(Please check one box for each statement.)*

Potential barriers are:	Not a barrier	Minor barrier	Moderate barrier	Significant barrier	Insurmountable barrier	Not sure
There are so many variables that must be considered.	☐	☐	☐	☐	☐	☐
Council structure is currently organized to deal with individual fishery management plans.	☐	☐	☐	☐	☐	☐
Lack of science to support EBFM plans.	☐	☐	☐	☐	☐	☐
Lack of definitive, achievable action plan for EBFM.	☐	☐	☐	☐	☐	☐
Lack of funding.	☐	☐	☐	☐	☐	☐
Constrained by Magnuson-Stevens Fishery Conservation and Management Act.	☐	☐	☐	☐	☐	☐
Lack of legislation clearly and specifically mandating EBFM.	☐	☐	☐	☐	☐	☐
Lack of reliable fish population models based on ecosystem-based principles.	☐	☐	☐	☐	☐	☐
Lack of stakeholder buy-in.	☐	☐	☐	☐	☐	☐
Lack of a leader to guide the way to adoption of EBFM.	☐	☐	☐	☐	☐	☐
Lack of political support.	☐	☐	☐	☐	☐	☐
Lack of workable examples and/or case studies of EBFM.	☐	☐	☐	☐	☐	☐
Lack of MAFMC leadership.	☐	☐	☐	☐	☐	☐
Overly precautionary management.	☐	☐	☐	☐	☐	☐

Potential barriers are:	Not a barrier	Minor barrier	Moderate barrier	Significant barrier	Insurmountable barrier	Not sure
Concern about lower fishing quotas.	☐	☐	☐	☐	☐	☐
Insufficient scientific data to support the transition to EBFM.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than they are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then there will be more administrative requirements than there are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management.	☐	☐	☐	☐	☐	☐

10. How significant do <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic Region</u> think each of the following is as a potential barrier to the Mid-Atlantic Fishery Management Council (MAFMC) in implementing ecosystem-based fisheries management (EBFM)? *(Please check one box for each statement.)*

Potential barriers are:		Not a barrier	Minor barrier	Moderate barrier	Significant barrier	Insurmountable barrier	Not Sure
There are so many variables that must be considered.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Council structure is currently organized to deal with individual fishery management plans.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable**	**Not Sure**
Lack of science to support EBFM plans.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of definitive, achievable action plan for EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of funding.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐

	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Constrained by Magnuson-Stevens Fishery Conservation and Management Act.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of legislation clearly and specifically mandating EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of reliable fish population models	**Commercial fishermen**	☐	☐	☐	☐	☐	☐

based on ecosystem-based principles.	**Recreational fishermen**	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Lack of stakeholder buy-in.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of a leader to guide the way to adoption of EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Lack of political support.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Lack of workable examples and/or case studies of EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of MAFMC leadership.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐

	Environmental NGOs	☐	☐	☐	☐	☐	☐
Overly precautionary management.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Concern about lower fishing quotas.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Insufficient scientific data to support the transition to EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐

	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than they are now under current management.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Concern that if EBFM is implemented, than there will be more administrative requirements than there are now under current management.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Concern that if EBFM is	**Commercial fishermen**	☐	☐	☐	☐	☐	☐

implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management.	**Recreational fishermen**	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐

than they are now under current management.	**Environmental NGOs**	☐	☐	☐	☐	☐	☐

11. How important do <u>YOU think</u> the following types of <u>social science information</u> are to support informed decisions for federally-managed fisheries in the Mid-Atlantic region? *(Please check one box for each statement.)*

Important types of social science information to support decisions are:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability.	☐	☐	☐	☐	☐	☐
Social, economic, and cultural impact of fisheries management on coastal communities.	☐	☐	☐	☐	☐	☐
Consumer support and market demand for sustainable seafood.	☐	☐	☐	☐	☐	☐
Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries. This is independent of whether or not the stakeholders fish or eat fish.	☐	☐	☐	☐	☐	☐
Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices.	☐	☐	☐	☐	☐	☐

Predicted regulation and quota changes to commercial fisheries under EBFM.	☐	☐	☐	☐	☐	☐
Important types of social science information to support decisions are:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Anticipated future political support for EBFM.	☐	☐	☐	☐	☐	☐
Anticipated future state and federal funding to support EBFM.	☐	☐	☐	☐	☐	☐
Willingness of commercial fishermen to modify fishing practices.	☐	☐	☐	☐	☐	☐
Willingness of recreational fishermen to modify fishing practices.	☐	☐	☐	☐	☐	☐
Willingness of seafood consumers to modify fishing practices.	☐	☐	☐	☐	☐	☐

12. How important do <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the Mid-Atlantic Region think the</u> following types of social science information are to support informed decisions for federally-managed fisheries in Mid-Atlantic? *(Please check one box for each statement.)*

Important types of social science information to support decisions are:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**

Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Social, economic, and cultural impact of fisheries management on coastal communities.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Consumer support and market demand for sustainable seafood.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Important types of social science information to support decisions are:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Value stakeholders gain from believing	**Commercial fishermen**	☐	☐	☐	☐	☐	☐

that an ecosystem perspective is being used to manage fisheries. This is independent of whether or not the stakeholders fish or eat fish.	**Recreational fishermen**	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Predicted regulation and quota changes to commercial fisheries under EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Important types of social science information to support decisions are:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Anticipated future political support for EBFM	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Anticipated future state and federal funding to support EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Willingness of commercial fishermen to modify fishing practices.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Important types of social science information to support decisions are:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Willingness of recreational fishermen to modify fishing practices.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Willingness of seafood consumers to modify behavior and purchases.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

13. How effective do YOU think communication about ecosystem-based fisheries management (EBFM) is FROM the Mid-Atlantic Fishery Management Council (MAFMC) TO the public? (*Please check all that apply.)*

- ☐ Extremely effective
- ☐ Very Effective
- ☐ Moderately Effective
- ☐ Slightly Effective
- ☐ Not effective
- ☐ Don't know

14. How effective do YOU think communication about ecosystem-based fisheries management (EBFM) is FROM the public TO the Mid-Atlantic Fishery Management Council (MAFMC)? (*Please check all that apply.)*

- ☐ Extremely effective
- ☐ Very Effective
- ☐ Moderately Effective
- ☐ Slightly Effective
- ☐ Not effective
- ☐ Don't know

15. Which of the following do you think are effective approaches to fostering communication between the Mid-Atlantic Fishery Management Council (MAFMC) and the public? (*Please check all that apply.)*

- ☐ Correspondence through members of fisheries-related organizations
- ☐ Council newsletter
- ☐ Council press releases
- ☐ In person conversations
- ☐ E-mail communication
- ☐ Website
- ☐ Informal local public meetings for MAFMC members and stakeholders
- ☐ Internet forums
- ☐ Opportunities for public comment at Council meetings
- ☐ Don't know
- ☐ Other - Please list: _____

16. Please list any other factors that you think may affect the practice of ecosystem-based fisheries management (EBFM) that the survey has not addressed.

Please use the space below for any additional comments you wish to make.

To return this questionnaire, simply seal it with the white removable seal, and drop it in the mail (return postage has been paid)

Thank you for your time and effort!

Hold for back cover with business reply

APPENDIX I

A Survey of Stakeholder Perspectives about Ecosystem-Based Fisheries Management and the New England Fishery Management Council

Cornell University
Human Dimensions Research Unit

A Survey of
Stakeholder Perspectives About
Ecosystem-Based Fisheries Management and
the New England Fishery Management Council

Research conducted by the Human Dimensions Research Unit
in the Department of Natural Resources
Cornell University

The goal of this project, conducted through Cornell University, is to improve understanding of stakeholders' views about using ecosystem-based fisheries management (EBFM) as a strategy to manage fish stocks administered by the New England Fishery Management Council (NEFMC). The purpose of this questionnaire is to gain your input as a NEFMC contributor about EBFM and its relevance to the NEFMC management principles. As a participant in federally-managed marine fisheries in the New England region, your input will help other fishery managers, policy-makers and researchers understand the range of perspectives and beliefs that are held by stakeholders about EBFM and will inform ongoing management decisions today and in the future.

Please complete this questionnaire as soon as you can, seal it with the white resealable label provided, and drop it in any mailbox; return postage has been paid. Your participation in this survey is voluntary, but we hope that you will take a few minutes to help and contribute your experiences and opinions. Your identity will be kept confidential and the information you give us will never be associated with your name. Thank you for taking the time to participate in this survey.

THANK YOU FOR YOUR HELP!

1. In addition to your role as a New England Fishery Management Council member, staff member, or Scientific and Statistical Committee member, how would you describe your participation in federally-managed marine fisheries in the New England region? (*Please check all that apply.)*

- ☐ Currently permitted commercial fisheries boat operator
- ☐ Marine recreational fisherman
- ☐ Currently permitted commercial fisheries boat owner
- ☐ Crew member on a commercial fishing boat
- ☐ A member of or staff for a nongovernmental organization related to fisheries
- ☐ Charter boat operator
- ☐ Charter boat owner
- ☐ Currently permitted commercial seafood dealer
- ☐ None of the above
- ☐ Other - Please list: _____

2. Are you familiar with the term "ecosystem-based fisheries management (EBFM)"?

Whatever your answer is to "Question 2," please continue answering the questionnaire after completing this question.

- ☐ Not familiar at all
- ☐ Slightly familiar
- ☐ Moderately familiar
- ☐ Very familiar

3. Please indicate to what extent <u>YOU agree or disagree</u> that the definition of "ecosystem-based fisheries management (EBFM)" should include the following <u>concepts</u>? *(Please check one box for each statement.)*

The definition should include:	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Considering the interactions between the physical, biological, and human factors that affect the health of fisheries.	☐	☐	☐	☐	☐	☐
Protecting and/or enhancing habitat.	☐	☐	☐	☐	☐	☐
Monitoring and enforcing EBFM.	☐	☐	☐	☐	☐	☐
Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries.	☐	☐	☐	☐	☐	☐
Developing stakeholder buy-in.	☐	☐	☐	☐	☐	☐
Adapting to changing biological and social conditions.	☐	☐	☐	☐	☐	☐
Incorporating geographically-specific management needs.	☐	☐	☐	☐	☐	☐
Including flexibility into management strategies.	☐	☐	☐	☐	☐	☐
Considering many ecological factors.	☐	☐	☐	☐	☐	☐
Balancing diverse social objectives.	☐	☐	☐	☐	☐	☐
Engaging stakeholders.	☐	☐	☐	☐	☐	☐
Accounting for uncertainty in ecosystems.	☐	☐	☐	☐	☐	☐
Addressing human needs, including those of fishermen and fishing	☐	☐	☐	☐	☐	☐

communities.							

4. Please indicate to what extent <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the New England Region would agree or disagree</u> that the definition of "ecosystem-based fisheries management (EBFM)" should include the following concepts. *(Please check one box for each statement.)*

The definition should include:		**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Considering the interactions between the physical, biological, and human factors that affect the health of fisheries.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Protecting and/or enhancing habitat.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Monitoring and enforcing EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational	☐	☐	☐	☐	☐	☐

	fishermen						
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
The definition should include:		**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Developing stakeholder buy-in.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Adapting to changing biological and social conditions.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐

	Environmental NGOs	☐	☐	☐	☐	☐	☐
Incorporating geographically-specific management needs.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
The definition should include:		**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Including flexibility into management strategies.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Considering many ecological factors.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Balancing diverse social objectives.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Engaging stakeholders.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
The definition should include:		**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Accounting for uncertainty in ecosystems.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Addressing human needs, including those	**Commercial fishermen**	☐	☐	☐	☐	☐	☐

of fishermen and fishing communities.	**Recreational fishermen**	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

5. How important do <u>YOU think</u> it is that the following practices should be implemented as part of fisheries management in the New England Fishery Management Council (NEFMC) over the next 10 years? *(Please check one box for each statement.)*

The following practices should be implemented as part of fisheries management:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions.	☐	☐	☐	☐	☐	☐
Establishing a specific operational plan for incorporating ecosystem considerations into NEFMC decision making.	☐	☐	☐	☐	☐	☐
Rewriting the NEFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based fisheries management (EBFM) principles.	☐	☐	☐	☐	☐	☐
Incorporating the EBFM approach into NEFMC priorities.	☐	☐	☐	☐	☐	☐

Continuing inclusion of stakeholders on the NEFMC Advisory Panel for EBFM.	☐	☐	☐	☐	☐	☐
Integrating social, economic, and community impact analyses into the NEFMC decision making processes.	☐	☐	☐	☐	☐	☐
Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught.	☐	☐	☐	☐	☐	☐

6. How important do <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the New England Region think</u> it is that the following practices should be implemented as part of fisheries management in the New England Fishery Management Council (NEFMC) over the next 10 years? *(Please check one box for each statement.)*

The following practices should be implemented as part of fisheries management:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Establishing a specific operational	**Commercial fishermen**	☐	☐	☐	☐	☐	☐

plan for incorporating ecosystem considerations into NEFMC decision making.	**Recreational fishermen**	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

The following practices should be implemented as part of fisheries management:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Rewriting the NEFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based fisheries management (EBFM) principles.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Incorporating the EBFM approach into NEFMC priorities.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Continuing inclusion of	**Commercial fishermen**	☐	☐	☐	☐	☐	☐

stakeholders on the NEFMC Advisory Panel for EBFM.	**Recreational fishermen**	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
The following practices should be implemented as part of fisheries management:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Integrating social, economic, and community impact analyses into the NEFMC decision making processes.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

7. How strongly would YOU support each one of the following options as a desired outcome for fisheries management in the New England Fishery Management Council (NEFMC) over the next 10 years? *(Please check one box for each statement.)*

The desired outcome for fisheries management should be:	Strongly support	Moderately support	Neutral	Moderately oppose	Strongly oppose	Don't know
Continuation of single species fisheries management as currently practiced, treating each fishery management plan as separate and slightly incorporating ecosystem interactions, such as essential fish habitat and marine mammals.	☐	☐	☐	☐	☐	☐
Incremental change from single species fisheries management to ecosystem-based fisheries management (EBFM) in which the Council considers existing species plans in relation to the ecosystems in which they occur and begins to consider how species and fisheries covered by different plans interact through mechanisms such as by-catch, predation, forage base, etc…	☐	☐	☐	☐	☐	☐
An intermediate change from single species fisheries management to EBFM in which single species fishery management plans are replaced with a smaller number of fishery management plans that each integrate several species according to proximity of ecological regions;	☐	☐	☐	☐	☐	☐

when taken together, the multi-species fishery management plans will directly or indirectly cover all the species in the system.						
The desired outcome for fisheries management should be:	**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
A complete, gradual (5-10 years) transition from single species fisheries management to EBFM that minimizes the number of fishery management plans and that explicitly considers interactions among species and fisheries and directly accounts for the most ecological factors possible including climate, environmental effects, predation, forage base, and habitat.	☐	☐	☐	☐	☐	☐
A complete, immediate change (0-4 years) from single species fisheries management to EBFM that minimizes the number of fishery management plans and that incorporates all fisheries species and environmental factors within the ecosystem being managed.	☐	☐	☐	☐	☐	☐

8. How strongly do <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the New England Region would support</u> each one of the following options as a desired outcome for fisheries management in the New England Fishery Management Council (NEFMC) over the next 10 years? *(Please check one box for each **statement.**)*

The desired outcome for fisheries management should be:		**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
Continuation of single species fisheries management as currently practiced, treating each fishery management plan as separate and slightly incorporating ecosystem interactions, such as essential fish habitat and marine mammals.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

The desired outcome for fisheries management should be:		**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
Incremental change from single species fisheries management to ecosystem-based fisheries management (EBFM) in which the Council considers existing species plans in relation to the ecosystems in which they occur and begins to consider how species and fisheries covered by different plans interact through mechanisms such as by-catch, predation, forage base, etc…	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

The desired outcome for fisheries management should be:		Strongly support	Moderately support	Neutral	Moderately oppose	Strongly oppose	Don't know
An intermediate change from single species fisheries management to EBFM in which single species fishery management plans are replaced with a smaller number of fishery management plans that each integrate several species according to proximity of ecological regions; when taken together, the multi-species fishery management plans will directly or indirectly cover all the species in the system.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

The desired outcome for fisheries management should be:		**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
A complete, gradual (5-10 years) transition from single species fisheries management to EBFM that minimizes the number of fishery management plans and that explicitly considers interactions among species and fisheries and directly accounts for the most ecological factors possible including climate, environmental effects, predation, forage base, and habitat.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

The desired outcome for fisheries management should be:		**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
A complete, immediate change (0-4 years) from single species fisheries management to EBFM that minimizes the number of fishery management plans and that incorporates all fisheries species and environmental factors within the ecosystem being managed.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

9. How significant do YOU think each of the following is as a potential barrier to the New England Fishery Management Council (NEFMC) in implementing ecosystem-based fisheries management (EBFM)? *(Please check one box for each statement.)*

Potential barriers are:	Not a barrier	Minor barrier	Moderate barrier	Significant barrier	Insurmountable barrier	Not sure
There are so many variables that must be considered.	☐	☐	☐	☐	☐	☐
Council structure is currently organized to deal with individual fishery management plans.	☐	☐	☐	☐	☐	☐
Lack of science to support EBFM plans.	☐	☐	☐	☐	☐	☐
Lack of definitive, achievable action plan for EBFM.	☐	☐	☐	☐	☐	☐
Lack of funding.	☐	☐	☐	☐	☐	☐
Constrained by Magnuson-Stevens Fishery Conservation and Management Act.	☐	☐	☐	☐	☐	☐
Lack of legislation clearly and specifically mandating EBFM.	☐	☐	☐	☐	☐	☐
Lack of reliable fish population models based on ecosystem-based principles.	☐	☐	☐	☐	☐	☐
Lack of stakeholder buy-in.	☐	☐	☐	☐	☐	☐
Lack of a leader to guide the way to adoption of EBFM.	☐	☐	☐	☐	☐	☐
Lack of political support.	☐	☐	☐	☐	☐	☐
Lack of workable examples and/or case studies of EBFM.	☐	☐	☐	☐	☐	☐

Lack of NEFMC leadership.	☐	☐	☐	☐	☐	☐
Overly precautionary management.	☐	☐	☐	☐	☐	☐
Potential barriers are:	**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not sure**
Concern about lower fishing quotas.	☐	☐	☐	☐	☐	☐
Insufficient scientific data to support the transition to EBFM.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than they are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then there will be more administrative requirements than there are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management.	☐	☐	☐	☐	☐	☐

Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management.	☐	☐	☐	☐	☐	☐

10. How significant do <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the New England Region</u> think each of the following is as a potential barrier to the New England Fishery Management Council (NEFMC) in implementing ecosystem-based fisheries management (EBFM)? *(Please check one box for each statement.)*

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
There are so many variables that must be considered.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Council structure is currently organized to deal with individual fishery	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐

management plans.	**SSC members**	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable**	**Not Sure**
Lack of science to support EBFM plans.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of definitive, achievable action plan for EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of funding.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐

	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Constrained by Magnuson-Stevens Fishery Conservation and Management Act.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of legislation clearly and specifically mandating EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of reliable fish population models based on ecosystem-based	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐

principles.	**SSC members**	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Lack of stakeholder buy-in.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of a leader to guide the way to adoption of EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of political support.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐

	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Lack of workable examples and/or case studies of EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Lack of NEFMC leadership.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Overly precautionary management.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐

	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		Not a barrier	Minor barrier	Moderate barrier	Significant barrier	Insurmountable barrier	Not Sure
Concern about lower fishing quotas.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Insufficient scientific data to support the transition to EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐

they are now under current management.	**SSC members**	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Potential barriers are:		**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not Sure**
Concern that if EBFM is implemented, than there will be more administrative requirements than there are now under current management.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Potential barriers are:		Not a barrier	Minor barrier	Moderate barrier	Significant barrier	Insurmountable barrier	Not Sure
Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

11. How important do <u>YOU think</u> the following types of <u>social science information</u> are to support informed decisions for federally-managed

fisheries in the New England region? *(Please check one box for each statement.)*

Important types of social science information to support decisions are:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability.	☐	☐	☐	☐	☐	☐
Social, economic, and cultural impact of fisheries management on coastal communities.	☐	☐	☐	☐	☐	☐
Consumer support and market demand for sustainable seafood.	☐	☐	☐	☐	☐	☐
Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries. This is independent of whether or not the stakeholders fish or eat fish.	☐	☐	☐	☐	☐	☐
Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices.	☐	☐	☐	☐	☐	☐
Predicted regulation and quota changes to commercial fisheries under EBFM.	☐	☐	☐	☐	☐	☐

Important types of social science information to support decisions are:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Anticipated future political support for EBFM.	☐	☐	☐	☐	☐	☐
Anticipated future state and federal funding to support EBFM.	☐	☐	☐	☐	☐	☐
Willingness of commercial fishermen to modify fishing practices.	☐	☐	☐	☐	☐	☐
Willingness of recreational fishermen to modify fishing practices.	☐	☐	☐	☐	☐	☐
Willingness of seafood consumers to modify fishing practices.	☐	☐	☐	☐	☐	☐

12. How important do <u>YOU think fishers, environmental nongovernmental organization leaders, and Scientific and Statistical Committee members in the New England Region think the</u> following types of social science information are to support informed decisions for federally-managed fisheries in New England? *(Please check one box for each statement.)*

Important types of social science information to support decisions are:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Social, economic, and cultural impact of fisheries management on coastal communities.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Consumer support and market demand for sustainable seafood.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐

	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Important types of social science information to support decisions are:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries. This is independent of whether or not the stakeholders fish or eat fish.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Predicted regulation and quota changes to commercial fisheries under	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐

EBFM.	**SSC members**	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Important types of social science information to support decisions are:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Anticipated future political support for EBFM	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Anticipated future state and federal funding to support EBFM.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Willingness of commercial fishermen to modify fishing practices.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

Important types of social science information to support decisions are:		**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Willingness of recreational fishermen to modify fishing practices.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐
Willingness of seafood consumers to modify behavior and purchases.	**Commercial fishermen**	☐	☐	☐	☐	☐	☐
	Recreational fishermen	☐	☐	☐	☐	☐	☐
	SSC members	☐	☐	☐	☐	☐	☐
	Environmental NGOs	☐	☐	☐	☐	☐	☐

13. How effective do YOU think communication about ecosystem-based fisheries management (EBFM) is FROM the New England Fishery Management Council (NEFMC) TO the public? (*Please check all that apply.)*

- ☐ Extremely effective
- ☐ Very Effective
- ☐ Moderately Effective
- ☐ Slightly Effective
- ☐ Not effective
- ☐ Don't know

14. How effective do YOU think communication about ecosystem-based fisheries management (EBFM) is FROM the public TO the New England Fishery Management Council (NEFMC)? (*Please check all that apply.)*

- ☐ Extremely effective
- ☐ Very Effective
- ☐ Moderately Effective
- ☐ Slightly Effective
- ☐ Not effective
- ☐ Don't know

15. Which of the following do you think are effective approaches to fostering communication between the New England Fishery Management Council (NEFMC) and the public? (*Please check all that apply.)*

- ☐ Correspondence through members of fisheries-related organizations
- ☐ Council newsletter
- ☐ Council press releases
- ☐ In person conversations
- ☐ E-mail communication
- ☐ Website
- ☐ Informal local public meetings for NEFMC members and stakeholders
- ☐ Internet forums
- ☐ Opportunities for public comment at Council meetings
- ☐ Don't know
- ☐ Other - Please list: _____

16. Please list any other factors that you think may affect the practice of ecosystem-based fisheries management (EBFM) that the survey has not addressed.

Please use the space below for any additional comments you wish to make.

To return this questionnaire, simply seal it with the white removable seal, and drop it in the mail (return postage has been paid)

Thank you for your time and effort!

Hold for back cover with business reply

APPENDIX J

A Survey of Stakeholder Perspectives about Ecosystem-Based Fisheries Management and the Mid-Atlantic Fishery Management Council

Cornell University
Human Dimensions Research Unit

A Survey of
Stakeholder Perspectives About
Ecosystem-Based Fisheries Management and
the Mid-Atlantic Fishery Management Council

Research conducted by the Human Dimensions Research Unit
in the Department of Natural Resources
Cornell University

The goal of this project, conducted through Cornell University, is to improve understanding of stakeholders' views about using ecosystem-based fisheries management (EBFM) as a strategy to manage fish stocks administered by the Mid-Atlantic Fishery Management Council (MAFMC). The purpose of this questionnaire is to gain your input as a stakeholder about EBFM and its relevance to the MAFMC management principles. As a participant in federally-managed marine fisheries in the Mid-Atlantic region, your input will help fishery managers, policy-makers and researchers understand the range of perspectives and beliefs that are held by stakeholders about EBFM and will inform ongoing management decisions today and in the future.

MARINE STAKEHOLDERS: WE NEED YOUR HELP.

YOUR OPINION MATTERS!

Please complete this questionnaire as soon as you can, seal it with the white re-sealable label provided, and drop it in any mailbox; return postage has been paid. Your participation in this survey is voluntary, but we hope that you will take a few minutes to help and contribute your experiences and opinions. Your identity will be kept confidential and the information you give us will never be associated with your name. Thank you for taking the time to participate in this survey.

THANK YOU FOR YOUR HELP!

1. **How would you describe your participation in federally-managed marine fisheries in the Mid-Atlantic region?** *(Please check all that apply.)*

- ☐ Currently permitted commercial fisheries boat operator
- ☐ Marine recreational fisherman
- ☐ Currently permitted commercial fisheries boat owner
- ☐ Crew member on a commercial fishing boat
- ☐ A member of or staff for a nongovernmental organization related to fisheries
- ☐ Charter boat operator
- ☐ Charter boat owner
- ☐ Currently permitted commercial seafood dealer
- ☐ None of the above
- ☐ Other - Please list: _____

2. Are you familiar with the term "ecosystem-based fisheries management (EBFM)"? *(Please check one box.)*
Whatever your answer is to "Question 2," please continue answering the questionnaire after completing this question.

☐ Not familiar at all

☐ Slightly familiar

☐ Moderately familiar

☐ Very familiar

3. Are you familiar with the Mid-Atlantic Fishery Management Council (MAFMC)? *(Please check one box.)*
Whatever your answer is to "Question 3," please continue answering the questionnaire after completing this question.

☐ Not familiar at all

☐ Slightly familiar

☐ Moderately familiar

☐ Very familiar

4. Please indicate to what extent YOU agree or disagree that the definition of "ecosystem-based fisheries management (EBFM)" should include the following concepts? *(Please check one box for each statement.)*

The definition should include:	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Considering the interactions between the physical, biological, and human factors that affect the health of fisheries.	☐	☐	☐	☐	☐	☐
Protecting and/or enhancing habitat.	☐	☐	☐	☐	☐	☐
Monitoring and enforcing EBFM.	☐	☐	☐	☐	☐	☐
Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries.	☐	☐	☐	☐	☐	☐
Developing stakeholder buy-in.	☐	☐	☐	☐	☐	☐
Adapting to changing biological and social conditions.	☐	☐	☐	☐	☐	☐
Incorporating geographically-specific management needs.	☐	☐	☐	☐	☐	☐
Including flexibility into management strategies.	☐	☐	☐	☐	☐	☐
Considering many ecological factors.	☐	☐	☐	☐	☐	☐
Balancing diverse social objectives.	☐	☐	☐	☐	☐	☐
Engaging stakeholders.	☐	☐	☐	☐	☐	☐
Accounting for uncertainty in ecosystems.	☐	☐	☐	☐	☐	☐
Addressing human needs, including those of fishermen and fishing communities.	☐	☐	☐	☐	☐	☐

5. How important do <u>YOU think</u> it is that the following practices should be implemented as part of fisheries management in the Mid-Atlantic Fishery Management Council (MAFMC) over the next 10 years? *(Please check one box for each statement.)*

The following practices should be implemented as part of fisheries management:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions.	☐	☐	☐	☐	☐	☐
Establishing a specific operational plan for incorporating ecosystem considerations into MAFMC decision making.	☐	☐	☐	☐	☐	☐
Rewriting the MAFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based fisheries management (EBFM) principles.	☐	☐	☐	☐	☐	☐
Incorporating the EBFM approach into MAFMC priorities.	☐	☐	☐	☐	☐	☐
Continuing inclusion of stakeholders on the MAFMC Advisory Panel for EBFM.	☐	☐	☐	☐	☐	☐
Integrating social, economic, and community impact analyses into the MAFMC decision making processes.	☐	☐	☐	☐	☐	☐
Transitioning from management based on quotas set per individual	☐	☐	☐	☐	☐	☐

species to management based on quotas set for the total biomass of all fish species caught.						

6. How strongly would <u>YOU support</u> each one of the following <u>options</u> as a desired outcome for fisheries management in the Mid-Atlantic Fishery Management Council (MAFMC) over the next 10 years? *(Please check one box for each statement.)*

The desired outcome for fisheries management should be:	**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
Continuation of single species fisheries management as currently practiced, treating each fishery management plan as separate and slightly incorporating ecosystem interactions, such as essential fish habitat and marine mammals.	☐	☐	☐	☐	☐	☐
Incremental change from single species fisheries management to ecosystem-based fisheries management (EBFM) in which the Council considers existing species plans in relation to the ecosystems in which they occur and begins to consider how species and fisheries covered by different plans interact through mechanisms such as by-catch, predation, forage base, etc…	☐	☐	☐	☐	☐	☐
An intermediate change from single species fisheries management to EBFM in which single species fishery management plans are replaced	☐	☐	☐	☐	☐	☐

with a smaller number of fishery management plans that each integrate several species according to proximity of ecological regions; when taken together, the multi-species fishery management plans will directly or indirectly cover all the species in the system.						
The desired outcome for fisheries management should be:	**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
A complete, gradual (5-10 years) transition from single species fisheries management to EBFM that minimizes the number of fishery management plans and that explicitly considers interactions among species and fisheries and directly accounts for the most ecological factors possible including climate, environmental effects, predation, forage base, and habitat.	☐	☐	☐	☐	☐	☐
A complete, immediate change (0-4 years) from single species fisheries management to EBFM that minimizes the number of fishery management plans and that incorporates all fisheries species and environmental factors within the ecosystem being managed.	☐	☐	☐	☐	☐	☐

7. How significant do YOU think each of the following is as a potential barrier to the Mid-Atlantic Fishery Management Council (MAFMC) in implementing ecosystem-based fisheries management (EBFM)? *(Please check one box for each statement.)*

Potential barriers are:	Not a barrier	Minor barrier	Moderate barrier	Significant barrier	Insurmountable barrier	Not sure
There are so many variables that must be considered.	☐	☐	☐	☐	☐	☐
Council structure is currently organized to deal with individual fishery management plans.	☐	☐	☐	☐	☐	☐
Lack of science to support EBFM plans.	☐	☐	☐	☐	☐	☐
Lack of definitive, achievable action plan for EBFM.	☐	☐	☐	☐	☐	☐
Lack of funding.	☐	☐	☐	☐	☐	☐
Constrained by Magnuson-Stevens Fishery Conservation and Management Act.	☐	☐	☐	☐	☐	☐
Lack of legislation clearly and specifically mandating EBFM.	☐	☐	☐	☐	☐	☐
Lack of reliable fish population models based on ecosystem-based principles.	☐	☐	☐	☐	☐	☐
Lack of stakeholder buy-in.	☐	☐	☐	☐	☐	☐
Lack of a leader to guide the way to adoption of EBFM.	☐	☐	☐	☐	☐	☐
Lack of political support.	☐	☐	☐	☐	☐	☐

Potential barriers are:	Not a barrier	Minor barrier	Moderate barrier	Significant barrier	Insurmountable barrier	Not sure
Lack of workable examples and/or case studies of EBFM.	☐	☐	☐	☐	☐	☐
Lack of MAFMC leadership.	☐	☐	☐	☐	☐	☐
Overly precautionary management.	☐	☐	☐	☐	☐	☐
Concern about lower fishing quotas.	☐	☐	☐	☐	☐	☐
Insufficient scientific data to support the transition to EBFM.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than they are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then there will be more administrative requirements than there are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management.	☐	☐	☐	☐	☐	☐

Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management.	☐	☐	☐	☐	☐	☐

8. How important do <u>YOU think</u> the following types of <u>social science information</u> are to support informed decisions for federally-managed fisheries in the Mid-Atlantic region? *(Please check one box for each statement.)*

Important types of social science information to support decisions are:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability.	☐	☐	☐	☐	☐	☐
Social, economic, and cultural impact of fisheries management on coastal communities.	☐	☐	☐	☐	☐	☐
Consumer support and market demand for sustainable seafood.	☐	☐	☐	☐	☐	☐
Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries. This is independent of whether or not the stakeholders fish or eat fish.	☐	☐	☐	☐	☐	☐
Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices.	☐	☐	☐	☐	☐	☐
Predicted regulation and quota changes to commercial fisheries under EBFM.	☐	☐	☐	☐	☐	☐

Important types of social science information to support decisions are:	Extremely important	Very important	Moderately important	Slightly important	Not important	Don't know
Anticipated future political support for EBFM.	☐	☐	☐	☐	☐	☐
Anticipated future state and federal funding to support EBFM.	☐	☐	☐	☐	☐	☐
Willingness of commercial fishermen to modify fishing practices.	☐	☐	☐	☐	☐	☐
Willingness of recreational fishermen to modify fishing practices.	☐	☐	☐	☐	☐	☐
Willingness of seafood consumers to modify fishing practices.	☐	☐	☐	☐	☐	☐

9. How effective do <u>YOU think</u> communication about ecosystem-based fisheries management (EBFM) is <u>FROM</u> the Mid-Atlantic Fishery Management Council (MAFMC) <u>TO</u> the public? (*Please check all that apply.)*

☐ Extremely effective

☐ Very Effective

☐ Moderately Effective

☐ Slightly Effective

☐ Not effective

☐ Don't know

10. How effective do <u>YOU think</u> communication about ecosystem-based fisheries management (EBFM) is <u>FROM</u> the public <u>TO</u> the Mid-Atlantic Fishery Management Council (MAFMC)? (*Please check all that apply.)*

- ☐ Extremely effective
- ☐ Very Effective
- ☐ Moderately Effective
- ☐ Slightly Effective
- ☐ Not effective
- ☐ Don't know

11. Which of the following do you think are effective approaches to fostering communication between the Mid-Atlantic Fishery Management Council (MAFMC) and the public? (*Please check all that apply.)*

- ☐ Correspondence through members of fisheries-related organizations
- ☐ Council newsletter
- ☐ Council press releases
- ☐ In person conversations
- ☐ E-mail communication
- ☐ Website
- ☐ Informal local public meetings for MAFMC members and stakeholders
- ☐ Internet forums
- ☐ Opportunities for public comment at Council meetings
- ☐ Don't know
- ☐ Other - Please list: _____

12. Please list any other factors that you think may affect the practice of ecosystem-based fisheries management (EBFM) that the survey has not addressed.

Please use the space below for any additional comments you wish to make.

To return this questionnaire, simply seal it with the white removable seal, and drop it in the mail (return postage has been paid)

Thank you for your time and effort!

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APPENDIX K

A Survey of Stakeholder Perspectives about Ecosystem-Based Fisheries Management and the New England Fishery Management Council

Cornell University
Human Dimensions Research Unit

A Survey of
Stakeholder Perspectives About
Ecosystem-Based Fisheries Management and
the New England Fishery Management Council

Research conducted by the Human Dimensions Research Unit
in the Department of Natural Resources
Cornell University

The goal of this project, conducted through Cornell University, is to improve understanding of stakeholders' views about using ecosystem-based fisheries management (EBFM) as a strategy to manage fish stocks administered by the New England Fishery Management Council (NEFMC). The purpose of this questionnaire is to gain your input as a stakeholder about EBFM and its relevance to the NEFMC management principles. As a participant in federally-managed marine fisheries in the New England region, your input will help fishery managers, policy-makers and researchers understand the range of perspectives and beliefs that are held by stakeholders about EBFM and will inform ongoing management decisions today and in the future.

MARINE STAKEHOLDERS: WE NEED YOUR HELP.

YOUR OPINION MATTERS!

Please complete this questionnaire as soon as you can, seal it with the white re-sealable label provided, and drop it in any mailbox; return postage has been paid. Your participation in this survey is voluntary, but we hope that you will take a few minutes to help and contribute your experiences and opinions. Your identity will be kept confidential and the information you give us will never be associated with your name. Thank you for taking the time to participate in this survey.

THANK YOU FOR YOUR HELP!

1. **How would you describe your participation in federally-managed marine fisheries in the New England region?** *(Please check all that apply.)*

- ☐ Currently permitted commercial fisheries boat operator
- ☐ Marine recreational fisherman
- ☐ Currently permitted commercial fisheries boat owner
- ☐ Crew member on a commercial fishing boat
- ☐ A member of or staff for a nongovernmental organization related to fisheries
- ☐ Charter boat operator
- ☐ Charter boat owner
- ☐ Currently permitted commercial seafood dealer
- ☐ None of the above
- ☐ Other - Please list: _____

2. Are you familiar with the term "ecosystem-based fisheries management (EBFM)"? *(Please check one box.)*
Whatever your answer is to "Question 2," please continue answering the questionnaire after completing this question.

☐ Not familiar at all

☐ Slightly familiar

☐ Moderately familiar

☐ Very familiar

3. Are you familiar with the New England Fishery Management Council (NEFMC)? *(Please check one box.)*
Whatever your answer is to "Question 3," please continue answering the questionnaire after completing this question.

☐ Not familiar at all

☐ Slightly familiar

☐ Moderately familiar

☐ Very familiar

4. Please indicate to what extent YOU agree or disagree that the definition of "ecosystem-based fisheries management (EBFM)" should include the following concepts? *(Please check one box for each statement.)*

The definition should include:	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Don't know**
Considering the interactions between the physical, biological, and human factors that affect the health of fisheries.	☐	☐	☐	☐	☐	☐
Protecting and/or enhancing habitat.	☐	☐	☐	☐	☐	☐
Monitoring and enforcing EBFM.	☐	☐	☐	☐	☐	☐
Assessing the social, economic, and cultural impacts on industries and communities that depend on fisheries.	☐	☐	☐	☐	☐	☐
Developing stakeholder buy-in.	☐	☐	☐	☐	☐	☐
Adapting to changing biological and social conditions.	☐	☐	☐	☐	☐	☐
Incorporating geographically-specific management needs.	☐	☐	☐	☐	☐	☐
Including flexibility into management strategies.	☐	☐	☐	☐	☐	☐
Considering many ecological factors.	☐	☐	☐	☐	☐	☐
Balancing diverse social objectives.	☐	☐	☐	☐	☐	☐
Engaging stakeholders.	☐	☐	☐	☐	☐	☐
Accounting for uncertainty in ecosystems.	☐	☐	☐	☐	☐	☐
Addressing human needs, including those of fishermen and fishing	☐	☐	☐	☐	☐	☐

communities.						

5. How important do <u>YOU think</u> it is that the following practices should be implemented as part of fisheries management in the New England Fishery Management Council (NEFMC) over the next 10 years? *(Please check one box for each statement.)*

The following practices should be implemented as part of fisheries management:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Identifying and prioritizing the key biological, physical, social, and economic factors that should drive decisions.	☐	☐	☐	☐	☐	☐
Establishing a specific operational plan for incorporating ecosystem considerations into NEFMC decision making.	☐	☐	☐	☐	☐	☐
Rewriting the NEFMC management requirements, under the Magnuson-Stevens Fishery Conservation and Management Act, to explicitly incorporate ecosystem-based fisheries management (EBFM) principles.	☐	☐	☐	☐	☐	☐
Incorporating the EBFM approach into NEFMC priorities.	☐	☐	☐	☐	☐	☐
Continuing inclusion of stakeholders on the NEFMC Advisory Panel for EBFM.	☐	☐	☐	☐	☐	☐
Integrating social, economic, and community impact analyses into	☐	☐	☐	☐	☐	☐

the NEFMC decision making processes.						
Transitioning from management based on quotas set per individual species to management based on quotas set for the total biomass of all fish species caught.	☐	☐	☐	☐	☐	☐

6. How strongly would <u>YOU support</u> each one of the following <u>options</u> as a desired outcome for fisheries management in the New England Fishery Management Council (NEFMC) over the next 10 years? *(Please check one box for each statement.)*

The desired outcome for fisheries management should be:	**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
Continuation of single species fisheries management as currently practiced, treating each fishery management plan as separate and slightly incorporating ecosystem interactions, such as essential fish habitat and marine mammals.	☐	☐	☐	☐	☐	☐
Incremental change from single species fisheries management to ecosystem-based fisheries management (EBFM) in which the Council considers existing species plans in relation to the ecosystems in which they occur and begins to consider how species and fisheries covered by different plans interact through mechanisms such as by-catch, predation, forage base, etc…	☐	☐	☐	☐	☐	☐

An intermediate change from single species fisheries management to EBFM in which single species fishery management plans are replaced with a smaller number of fishery management plans that each integrate several species according to proximity of ecological regions; when taken together, the multi-species fishery management plans will directly or indirectly cover all the species in the system.	☐	☐	☐	☐	☐	☐
The desired outcome for fisheries management should be:	**Strongly support**	**Moderately support**	**Neutral**	**Moderately oppose**	**Strongly oppose**	**Don't know**
A complete, gradual (5-10 years) transition from single species fisheries management to EBFM that minimizes the number of fishery management plans and that explicitly considers interactions among species and fisheries and directly accounts for the most ecological factors possible including climate, environmental effects, predation, forage base, and habitat.	☐	☐	☐	☐	☐	☐
A complete, immediate change (0-4 years) from single species fisheries management to EBFM that minimizes the number of fishery management plans and that incorporates all fisheries species and	☐	☐	☐	☐	☐	☐

environmental factors within the ecosystem being managed.						

7. How significant do <u>YOU think</u> each of the following is as a potential <u>barrier</u> to the New England Fishery Management Council (NEFMC) in implementing ecosystem-based fisheries management (EBFM)? *(Please check one box for each statement.)*

Potential barriers are:	**Not a barrier**	**Minor barrier**	**Moderate barrier**	**Significant barrier**	**Insurmountable barrier**	**Not sure**
There are so many variables that must be considered.	☐	☐	☐	☐	☐	☐
Council structure is currently organized to deal with individual fishery management plans.	☐	☐	☐	☐	☐	☐
Lack of science to support EBFM plans.	☐	☐	☐	☐	☐	☐
Lack of definitive, achievable action plan for EBFM.	☐	☐	☐	☐	☐	☐
Lack of funding.	☐	☐	☐	☐	☐	☐
Constrained by Magnuson-Stevens Fishery Conservation and Management Act.	☐	☐	☐	☐	☐	☐
Lack of legislation clearly and specifically mandating EBFM.	☐	☐	☐	☐	☐	☐
Lack of reliable fish population models based on ecosystem-based principles.	☐	☐	☐	☐	☐	☐
Lack of stakeholder buy-in.	☐	☐	☐	☐	☐	☐
Lack of a leader to guide the way to adoption of EBFM.	☐	☐	☐	☐	☐	☐
Lack of political support.	☐	☐	☐	☐	☐	☐

Potential barriers are:	Not a barrier	Minor barrier	Moderate barrier	Significant barrier	Insurmountable barrier	Not sure
Lack of workable examples and/or case studies of EBFM.	☐	☐	☐	☐	☐	☐
Lack of NEFMC leadership.	☐	☐	☐	☐	☐	☐
Overly precautionary management.	☐	☐	☐	☐	☐	☐
Concern about lower fishing quotas.	☐	☐	☐	☐	☐	☐
Insufficient scientific data to support the transition to EBFM.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the complexity of fishing regulations will be greater than they are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then there will be more administrative requirements than there are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the profits for fishermen and the fisheries industry will be less than they are now under current management.	☐	☐	☐	☐	☐	☐
Concern that if EBFM is implemented, then the level of uncertainty in fish population assessments will be greater than it is now under current management.	☐	☐	☐	☐	☐	☐

Concern that if EBFM is implemented, then fishing quotas for individual managed species will be less than they are now under current management.	☐	☐	☐	☐	☐	☐

8. How important do <u>YOU think</u> the following types of <u>social science information</u> are to support informed decisions for federally-managed fisheries in the New England region? *(Please check one box for each statement.)*

Important types of social science information to support decisions are:	**Extremely important**	**Very important**	**Moderately important**	**Slightly important**	**Not important**	**Don't know**
Economic impact of fisheries management on the commercial and recreational fishing industries, including revenue and job availability.	☐	☐	☐	☐	☐	☐
Social, economic, and cultural impact of fisheries management on coastal communities.	☐	☐	☐	☐	☐	☐
Consumer support and market demand for sustainable seafood.	☐	☐	☐	☐	☐	☐
Value stakeholders gain from believing that an ecosystem perspective is being used to manage fisheries. This is independent of whether or not the stakeholders fish or eat fish.	☐	☐	☐	☐	☐	☐
Improved understanding of how the Magnuson-Stevens Fishery Conservation and Management Act supports ecosystem-based fisheries management practices.	☐	☐	☐	☐	☐	☐
Predicted regulation and quota changes to commercial fisheries under EBFM.	☐	☐	☐	☐	☐	☐

Important types of social science information to support decisions are:	Extremely important	Very important	Moderately important	Slightly important	Not important	Don't know
Anticipated future political support for EBFM.	☐	☐	☐	☐	☐	☐
Anticipated future state and federal funding to support EBFM.	☐	☐	☐	☐	☐	☐
Willingness of commercial fishermen to modify fishing practices.	☐	☐	☐	☐	☐	☐
Willingness of recreational fishermen to modify fishing practices.	☐	☐	☐	☐	☐	☐
Willingness of seafood consumers to modify fishing practices.	☐	☐	☐	☐	☐	☐

9. How effective do <u>YOU think</u> communication about ecosystem-based fisheries management (EBFM) is <u>FROM</u> the New England Fishery Management Council (NEFMC) <u>TO</u> the public? (*Please check all that apply.)*

☐ Extremely effective

☐ Very Effective

☐ Moderately Effective

☐ Slightly Effective

☐ Not effective

☐ Don't know

10. How effective do YOU think communication about ecosystem-based fisheries management (EBFM) is FROM the public TO the New England Fishery Management Council (NEFMC)? (*Please check all that apply.)*

- ☐ Extremely effective
- ☐ Very Effective
- ☐ Moderately Effective
- ☐ Slightly Effective
- ☐ Not effective
- ☐ Don't know

11. Which of the following do you think are effective approaches to fostering communication between the New England Fishery Management Council (NEFMC) and the public? (*Please check all that apply.)*

- ☐ Correspondence through members of fisheries-related organizations
- ☐ Council newsletter
- ☐ Council press releases
- ☐ In person conversations
- ☐ E-mail communication
- ☐ Website
- ☐ Informal local public meetings for NEFMC members and stakeholders
- ☐ Internet forums
- ☐ Opportunities for public comment at Council meetings
- ☐ Don't know
- ☐ Other - Please list: _____

12. Please list any other factors that you think may affect the practice of ecosystem-based fisheries management (EBFM) that the survey has not addressed.

Please use the space below for any additional comments you wish to make.

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Thank you for your time and effort!

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